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A MANUAL

OF

ORGANIC MATERIA MEDICA.

BEING A

GUIDE TO MATERIA MEDICA OF THE VEGETABLE
AND ANIMAL KINGDOMS,

FOR THE

USE OF STUDENTS, DRUGGISTS, PHARMACISTS, AND
PHYSICIANS.

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BY

JOHN M. MAISCH, PH. M., PHAR. D.,

PROFESSOR OF MATERIA MEDICA AND BOTANY IN THE PHILADELPHIA COLLEGE OF PHARMACY.

FIFTH EDITION.

WITH TWO HUNDRED AND SEVENTY ILLUSTRATIONS.

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PREFACE TO FIFTH EDITION.

In its present form the "Manual" differs from that of the preceding edition mainly in this, that the recent observations and investigations on the various articles of materia medica, as far as they come within the scope of this work, have been incorporated, and that the pronunciation of the systematic names of plants and animals has been indicated by marks of accent. In addition to this, the text has been carefully revised, with the view of rendering the characterization of the drugs and of their constituents even more precise and available for critical research; a number of new illustrations, partly replacing others, have been prepared in elucidation of structural descriptions; and the pharmacopœial drugs have been more conspicuously distinguished by the selection of smaller type for those articles which are not recognized by the Pharmacopœia, or which at present are scarcely ever met with in commerce. Of the same importance as pharmacopœial crude drugs appear to be such as—like Juniperus virginiana, Rhamnus Purshiana, etc.—bear a close resemblance to officinal ones, or which—like Sabadilla, Cocculus indicus, etc.—are the sources of proximate principles admitted into the Pharmacopœia as important remedies; hence, such drugs have been designated by the same kind of type.

In indicating the pronunciation the U. S. Pharmacopœia has been closely followed; but in several cases, where different pronunciations appear to be sanctioned by good authorities, the two forms are given side by side. On page 79 it was overlooked to alter the word A'lthæa to Althæ'a, as correctly given on page 313.

The best thanks of the author are due to several correspondents for their valuable suggestions.

AUGUST, 1892.

PREFACE TO FOURTH EDITION.

Eight years ago, when the first edition of this "Manual" was published, the author explained the scope of the work as embracing the drugs of animal and vegetable origin recognized by the Pharmacopœias of the United States and Great Britain, supplemented by important non-officinal drugs, and by others recently introduced or revived, which seemed to deserve attention.

The system of classification which was adopted in the first has been retained in the later editions with very slight modifications; it has been found to be readily comprehended and easily applied by those for whose use the work is intended, although the author is conscious of its imperfections and the inherent causes for the same.

It is in the nature of descriptive works that a certain monotony—inseparable from the material treated of—renders the text uninviting to the casual reader not interested in the subjects, or ignorant of the intrinsic importance of the various details. For practical application, however, a description of the *essential* physical, histological, and chemical characters of the organic drugs is needful, and to the student is of the utmost importance, as a guide in studying the different drugs and determining the variations in characteristics caused by diverse agencies. While the physical characters may, as a rule, be readily ascertained and com-

In indicating the pronunciation the U. S. Pharmacopoeia has been closely followed; but in several cases, where different pronunciations appear to be sanctioned by good authorities, the two forms are given side by side. On page 79 it was overlooked to alter the word A'lthæa to Althæ'a, as correctly given on page 313.

The best thanks of the author are due to several correspondents for their valuable suggestions.

August, 1882.

pared with those of similar drugs without the use of special appliances, a moderately magnifying pocket lens will be found useful as an aid in demonstrating the outlines of structure, and its use is likely to lead to more minute research by means of the microscope. A knowledge of the proximate principles of drugs is of value on account of the medical properties which these principles may possess, and for the equally, if not more, important reason that their behavior to solvents and to other compounds will determine, both for galenical and extemporaneous preparations, the selection of a suitable menstruum and the avoidance of chemical incompatibles. But in scanning the pages of the "Manual" the careful observer and the attentive student cannot help observing how much there still remains to be done for many drugs, notably those indigenous to North America, as well as most of those which have been introduced during recent years.

In preparing each successive edition the author has kept the above objects steadily in view, and is gratified to observe that the general plan which he has adopted has met the approval of most teachers of pharmaceutic materia medica, and that the book has steadily gained in favor with students and others using it. The author hopes that it may also, in a measure, have accomplished the ulterior purpose of stimulating original research in some of the directions indicated above.

The principal change made in the present edition is in the list of drugs arranged according to origin, in which Bentham and Hooker's "*Genera Plantarum*" (published in London from 1862 to 1883) has been followed. The arrangement according to that high authority seemed to be particularly appropriate at the present time in view of the approaching revision of the United States Pharmacopœia. While only a few drugs have been added to those previously described, every page of the present issue will bear evidence of the endeavor to make it conform to the present knowledge of the drugs in use, embracing the results of all important new investigations, and it is hoped that the work will prove to be as acceptable and useful as the preceding issues.

JANUARY, 1890.

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A MANUAL OF MATERIA MEDICA.

INTRODUCTION.

In arranging the vast mass of material within our reach for the study of Materia Medica several methods may be followed:

1. An alphabetical arrangement, while it affords us all the advantages due to facility of references, lacks the essential requisites of a *systematic* investigation of the subject.

2. The classification usually adopted in works intended for the use of Medical Students and Physicians is based upon a similarity in the action of drugs on the animal economy; and it presents obvious conveniences for the purpose.

3. Another method of classification is founded upon the chemical relation of substances which have a definite composition, and upon the botanical and zoölogical origin of organic drugs. This method has been followed by Pereira, Guibourt, Royle, Bentley, and by Flückiger (Grundriss), and is employed in the "Pharmacographia" and in other valuable and instructive works. Its chief advantage, as far as Vegetable Materia Medica is concerned, is due to the close chemical and physiological relations of the different parts of the same species, and in many instances of the different plants belonging to the same natural order. A synopsis of such classification will be found in the present volume, arranged according to Bentham and Hooker's "Genera Plantarum."

4. But the primary object of Pharmacognosy or Materia Medica, as more especially adapted to the needs of the Pharmacist and the Druggist, is to enable us to recognize drugs, to determine their quality, to detect their adulteration, and to distinguish the characteristic elements of those which are closely allied. Organic drugs which resemble one another in physical and structural properties are thus naturally brought together; and the special properties of each are made the more prominent by comparison. Classifications based on these considerations have been elaborated by Berg, Schleiden, Planchon, Flückiger (Lehrbuch), Wigand, Marmé, and others, and have been found useful and instructive. With such modifications as we have thought desirable, such a system has been adopted in this work.

The medical properties and doses of the various drugs, and the treatment of poisoning from excessive doses of what are usually designated as "poisonous drugs," are briefly presented as matters of important information; but it is not the design of this treatise to give instruction in the therapeutical application of medicines.

The development of the different organs of plants and of the histological changes incident to their growth, and the botanical relations of the different natural orders and species of medicinal plants, are subjects which are foreign to the scope of our work. Their consideration is appropriate to a separate course as an introduction to the study of Materia Medica proper. Bastin's "College Botany," Gray's "Structural Botany," Bentley's "Manual of Botany," and the works of Sachs, DeBary, and Thomé, will prove excellent books of reference and study for those who desire information, which it is not the object of this treatise to furnish, on Vegetable Anatomy, Organography, and Systematic Botany.

PART I.

ANIMAL DRUGS.

They consist either wholly or in part of cellular tissue, except a few which are free from it. On being heated, they give off vapors having a peculiar animal empyreumatic odor, resembling the odor of burning horn or urine.

1. ANIMALS.

CANTHARIS.—Cantharides.

Spanish flies.

Cántharis (Lyt′ta, *Fabricius*) vesicatória, *De Geer.*

Class, Insecta; *order*, Coleoptera.

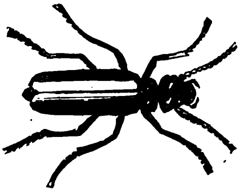
Habitat.—Southern and Central Europe, mainly upon oleaceæ and caprifoliaceæ.

Collection.—By shaking the trees or shrubs, or beating the branches in the morning, and killing the insects with hot water, or, after placing them in a well-closed vessel, with oil of turpentine, carbon disulphide, or ammonia. Yield of dry insects about 40 per cent.

Description.—From 15 to 30 millimeters ($\frac{3}{5}$–$1\frac{1}{5}$ inches) long, and 6 to 8 millimeters ($\frac{1}{4}$–$\frac{1}{3}$ inch) broad; head obtusely triangular and somewhat heart-shaped, with filiform, in the upper part, black antennæ; thorax obtusely quadrangular; the flattish cylindrical body covered with the ample membranous, brownish, transparent wings, and these with the long wing-cases, which, like the other parts, are of a shining copper-green color; odor strong and disagreeable; taste acrid. They yield a grayish-brown powder, containing green, shining particles.

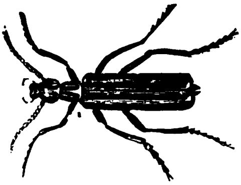
Cantharides should be thoroughly dried at a temperature of 40° C. (104° F.) and preserved in well-closed vessels. On keeping cantharides without previous drying in this manner, the addition of a little oil of turpentine, chloroform, benzol, or carbon disulphide is useful for preventing the attack of mites.

Fig. 1.



Cantharis vesicatoria.

Fig. 2.



Cantharis vittata.

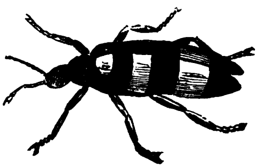
Constituents.—Cantharidin, $C_{10}H_{12}O_4$ (colorless scales or prisms, soluble in alcohol, ether, chloroform, fats, volatile oils, glacial acetic acid, also sparingly in water; sublimable; with alkalies yields cantharidates), also fat, odorous compound, various extractives, and salts; ash about 6 per cent.; moisture about 10 per cent.

Valuation.—The powder is exhausted with chloroform (containing some HCl) or acetic ether, the solution evaporated, fat and coloring matter removed by carbon disulphide; yield 0.4–0.7 per cent. cantharidin. It is with difficulty obtained in crystals from old cantharides; these may be treated with potassa and then with hydrochloric acid, or mixed with magnesia and water, dried, acidulated, deprived of oil by petroleum benzin, and exhausted with chloroform, etc.

Other species.—Cántharis (Epicáuta, *Fabricius*) vittáta, *Latreille,* potato fly, indigenous to the United States; wing-cases black, each with a yellow margin, and a yellow stripe along the middle; contains, when fresh, 1.3 per cent. cantharidin.

Mylábris cichórii, *Fabricius*, and M. phaleráta, *Pallas.* Chinese blistering flies. Indigenous to Southern and Eastern Asia; black, wing-cases with two bands and at the base with two spots; bands and spots orange-yellow; contain 1.0–1.2 per cent. cantharidin.

FIG. 3.



Mylabris cichorii.

Mylábris bifasciáta, from Southern Africa. About 25 millimeters (1 inch) long; black, upon the wing-cases two undulating narrow dark yellow bands; contain 1.0 to 1.09 per cent. cantharidin.

Properties.—Diuretic, aphrodisiac, acrid poison; externally, rubefacient, vesicant. *Dose*, 0.01 to 0.07 gram (gr. $\frac{1}{6}$–gr. j), mostly in form of tincture.

Antidotes.—Evacuation (stomach-pump, or emetics); demulcents (barley water, flaxseed tea—*not* oils, or oil emulsions); morphine.

COCCUS.—COCHINEAL.

Coccionella.

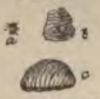
Cóccus cácti, *Linné.*

Class, Insecta; *order*, Hemiptera.

Habitat—Mexico and Central America, upon Opúntia cochinillífera, *Miller*, and other species.

Collection. — Cultivated; the wingless females, after fecundation, increase in size; they are brushed off from the plants and killed by hot water, or the heat of an oven.

FIG. 4.



Coccus cacti.—Female insect, natural size; *a*, before, and *b*, *c*, after impregnation, dry, and soaked in water.

Description. — About 5 millimeters ($\frac{1}{5}$ inch) long, oblong, angular, flat or concave beneath, and with 6 short legs, convex above, annulate and wrinkled, purplish-black or gray, yielding a dark red powder; odor faint, taste slightly bitter.

Granilla is an inferior kind, and consists of the smaller and of uncultivated insects.

Adulteration.—The silvery-gray cochineal with carbonate or sulphate of barium and lead; the black cochineal with graphites, ivory black, or manganese dioxide; on maceration in water the powders are separated.

Valuation.—Exhausting with boiling distilled water, and decolorizing the cold decoction with potassium permanganate, preferably in the presence of a little indigo-carmine.

Constituents.—About 10 per cent. of carminic acid, $C_{17}H_{18}O_{10}$ (brownish-purple, yielding a red powder; very soluble in water, alcohol, and alkalies, precipitated purple by earths; insoluble in fats and volatile oils; splits into sugar and carmine red, $C_{11}H_{12}O_7$, a vermilion-red powder, also soluble in water, alcohol, and alkalies); about 18 per cent. of wax and fat; the wax, coccerin, forms the wool-like covering of gray cochineal; the fat consists of myristin, liquid fat, and fat acids; various organic compounds; ash about 3 per cent. (not much more than 1 per cent., *Brit. Phar.*); moisture about 6 per cent.

Properties.—Stimulant, antispasmodic, diuretic, chiefly used for its coloring-matter. *Dose,* 0.06 to 1 gram (gr. j–xv).

Carmine is the precipitate obtained from the decoction of cochineal with alum or cream of tartar, and contains 50–60 per cent. of coloring-matter, the balance being moisture, nitrogen compounds, traces of wax, and some ash.

BLATTA.—Cockroach.

Blátta (Periplanéta, *Burmeister*) orientális, *Linné.*

Class, Insecta ; *order,* Orthoptera.

Habitat.—Asia, now found in most parts of the world, in kitchens and damp, warm rooms.

Description.—About 25 millimeters (1 inch) long, oblong, flat; reddish-brown or black-brown; antennæ long, filiform; head hidden beneath the prothorax; wings in the male long, in the female very short; odor very disagreeable.

Constituents.—Fetid oil, extractive, antihydropin (crystallizable, not diuretic), trimethylamine, ammonia.

Properties.—Diuretic. *Dose,* 0.3 to 0.6 gram (gr. v–x), in powder or tincture.

Other species of Blatta resemble the above in odor and perhaps in properties. *B. gigántea* of the West Indies is about 5 centimeters (2 inches) long. *B. americána* of North America is 25 to 30 millimeters (1 to 1⅕ inch) long. *B. germánica* of Central Europe is 10 to 12 millimeters (about ½ inch) long.

HIRUDO.—Leech.

1. Sanguisúga medicinális, *Savigny;* and 2. San. officinális, *Sav.* *Class,* Vermes; *order,* Annelida; *sub-order,* Apoda; *family,* Hirudinea.

Habitat.—1. Central and Northern Europe (Swedish or German leech); 2. Southern Europe (Hungarian leech); in fresh-water ponds.

Description.—Body 7 to 15 centimeters (3 to 6 inches) long, smooth, soft, round, somewhat flattened, narrowed toward both ends, composed of 90 to 100 rings; posterior end terminated by a broad disk, anterior end by a narrower disk, in the centre with the mouth, containing 3 jaws, each with a double row of teeth; back olive-green or blackish-green, with 6 longitudinal stripes dotted with black; belly yellowish-green or olive-green —No. 1 with numerous black spots, No. 2 with a black line on each side, unspotted. No. 1 draws readily about its own weight of blood; No. 2 draws more, and a larger amount of blood will flow after the animal has fallen.

Preservation.—In clear river water in a shady place, free from noxious vapors; temperature 10° to 20° C. (50° to 68° F.); the bottom covered or the greater part of the vessel filled with pebbles, turf, moss, some charcoal.

Leeches gorged with blood should be kept by themselves, and not used for six months or more; they may be made to disgorge the blood by placing them for a short time in a solution of table salt.

Uses.—For local depletion.

2. EGGS.

OVUM.—Egg.

Origin.—Gállus Bánkiva, var. domésticus, *Temminck*, s. Phasiánus Gállus, *Linné.* *Class*, Aves; *order*, Gallinæ.

Habitat.—Java and Cochinchina, domesticated.

The egg consists of the shell and lining membrane about 10 per cent., albumen 60, and yolk 30 per cent.

1. *Testa ovi*, *Egg-shell.*—Composed of 90–97 per cent. calcium carbonate, 1–5.7 calcium and magnesium phosphates, and 2–4 7 organic matter.

2. *Albumen ovi*, *White of egg.*—Weight 20 to 26 grams (℥v–vjss). Contains 82–88 per cent. water and 12–18 per cent. solid constituents, mostly albumin, traces of fat, sugar, and extractive, and about 0.65 ash, of which 42 per cent. is KCl and 9 NaCl, the remainder being carbonates, phosphates, and sulphates of alkalies, calcium, magnesium, and iron.

3. *Vitellus ovi*, *Yolk*, *Yelk.*—Contains 48–55 per cent. water, 16 vitellin (a proteid related to casein, mixed with albumin), 30 fat, 1.5 inorganic salts (chlorides, sulphates, and phosphates of potassium, sodium, calcium, and magnesium),

0.42 cholesterin; also lecithin, coloring-matter, lactic acid, sugar.

Properties and Uses.—Egg-shell is antacid. White of egg is nutritious, and used for the clarification of liquids and as an antidote to metallic poisons. Yelk is nutritious, and used for emulsionizing oils and as a dressing for burns, etc.

3. ANASTOMOSING FIBROUS TISSUE.

SPONGIA.—SPONGE.

Origin.—Spóngia officinális, *Linné.* *Class,* Poriphera; *order,* Ceratospongiæ.

Habitat.—In the sea attached to rocks; sometimes planted.

Collection.—By diving and cutting, or the inferior kinds by tearing from the rocks with a forked instrument. The gelatinous animal matter is removed by exposure and washing.

Description.—A framework consisting of long, elastic, ramifying, and anastomosing fibres, and traversed by numerous smaller or larger cavities and pores; yellowish, brownish, or brown; soluble in potassa solution with evolution of ammonia; charred by heating, giving off empyreumatic ammoniacal vapors.

The best kind is the soft, cup-shaped Turkey sponge, collected on the coast of Asia Minor and Syria from Euspóngia mollíssima, *O. Schmidt.* Zimocca sponge, from Euspóngia Zimócca, *Schmidt,* coast of Greece, is flatter, harder, and less elastic. Bathing sponge, from Euspóngia équina, *Schmidt,* North African coast, is nearly spheroid and coarse. The sheeps'-wool, Bahama, Florida, and Nassau sponges are obtained from the West Indies from different varieties of the preceding species.

Constituents.—Spongin (slowly soluble in cuprammonium solutions; soluble in KHO with evolution of NH_3; yields with H_2SO_4 leucin and glycocoll [glycin]); various salts; when free from sand, etc., ash 3–4 per cent.

Uses.—For cleaning, absorbing liquids, dilating cavities (sponge tents); for preparing *burnt sponge, spongia usta,* by heat in covered vessels (yield 30–35 per cent.); contains silica, potassium and sodium chloride and bromide, calcium carbonate and sulphate, and about 1.8 per cent. of iodine, combined with sodium and potassium.

4. MEMBRANOUS TISSUE AND GELATINS.

ICHTHYOCOLLA.—Isinglass.

Colla piscium. Russian isinglass.

Origin.—Acipénser Húso, *Linné* (belugo); Ac. Güldenstäd'tii, *Brand et Ratzeburg* (osseter); Ac. ruthénus, *Linné* (sterlet); Ac. stellátus, *Pallas* (sewruga). *Class,* Pisces; *order,* Sturiones (Ganoidei, Acipenseridæ).

Habitat.—Caspian and Black Seas and tributary rivers.

Preparation.—The swimming bladder is cut, washed, deprived of the outer layer, and dried.

Description.—In separate sheets (leaf isinglass), several sheets folded together (book isinglass), or rolled and folded into various forms (staple isinglass), of horny or pearly appearance, whitish or yellowish, semi-transparent, iridescent, tough, tearing parallel with the fibres, inodorous, insipid; almost completely soluble in boiling water and in boiling diluted alcohol. The solution in 24 parts of hot water forms, on cooling, a transparent jelly.

Other kinds.—American isinglass. The sounds of Gádus merlúccius, *Linné* (hake), and Otólithus regális, *Cuvier* (weak fish), dried in thin sheets or ribbons.

Purse or pipe isinglass. Fish sounds dried without being cut open.

Japanese or Chinese isinglass (agar-agar) is prepared from Eucheúma spinósum, *Agardh,* Graciléria lichenoídes, *Agardh,* and other algæ.

Constituents.—Gelatin (glutin) with about 2 (the inferior kinds sometimes 30) per cent. of insoluble membrane; ash about 0.5 per cent.

Properties.—Emollient, nutritive, externally as a protective.

GELATINA.—GELATIN.

Preparation.—Bone cartilage, skins, tendons, and ligaments are boiled in water until dissolved, and the resulting jelly is dried in the air.

Description.—Thin, transparent sheets, or porous and opaque layers, or shreds; the solution in hot water is colorless and inodorous. Inferior kinds of gelatin are called glue. It dissolves freely in acetic acid (*liquid glue*); its aqueous solution is not precipitated by dilute acids, alum, lead acetate, and ferric salts; it is precipitated by tannin; its solution, containing $K_2Cr_2O_7$, yields an insoluble compound on exposure to light.

Composition.—Glutin contains about 50 per cent. C, 18 N, 7 H, 24 O, and 0.5 S.

Chondrin resembles gelatin; it is obtained from the cartilages of the ribs and other non-ossifying cartilages; its aqueous solution is precipitated by alum, lead acetate, ferric salts, acetic acid, and a small quantity of mineral acids; it is not precipitated by tannin or mercuric chloride.

Properties.—Emollient, slightly nutritive, externally as a protective.

5. SECRETIONS AND EXCRETIONS.

a. Friable, not Fusible.

MOSCHUS.—MUSK.

Origin.—From the preputial follicles of the male animal, Móschus moschíferus, *Linné.* *Class,* Mammalia; *order,* Ruminantia; *family,* Cervidæ.

Habitat.—Central Asia.

4. But the primary object of Pharmacognosy or Materia Medica, as more especially adapted to the needs of the Pharmacist and the Druggist, is to enable us to recognize drugs, to determine their quality, to detect their adulteration, and to distinguish the characteristic elements of those which are closely allied. Organic drugs which resemble one another in physical and structural properties are thus naturally brought together; and the special properties of each are made the more prominent by comparison. Classifications based on these considerations have been elaborated by Berg, Schleiden, Planchon, Flückiger (Lehrbuch), Wigand, Marmé, and others, and have been found useful and instructive. With such modifications as we have thought desirable, such a system has been adopted in this work.

The medical properties and doses of the various drugs, and the treatment of poisoning from excessive doses of what are usually designated as "poisonous drugs," are briefly presented as matters of important information; but it is not the design of this treatise to give instruction in the therapeutical application of medicines.

The development of the different organs of plants and of the histological changes incident to their growth, and the botanical relations of the different natural orders and species of medicinal plants, are subjects which are foreign to the scope of our work. Their consideration is appropriate to a separate course as an introduction to the study of Materia Medica proper. Bastin's "College Botany," Gray's "Structural Botany," Bentley's "Manual of Botany," and the works of Sachs, DeBary, and Thomé, will prove excellent books of reference and study for those who desire information, which it is not the object of this treatise to furnish, on Vegetable Anatomy, Organography, and Systematic Botany.

PART I.

ANIMAL DRUGS.

THEY consist either wholly or in part of cellular tissue, except a few which are free from it. On being heated, they give off vapors having a peculiar animal empyreumatic odor, resembling the odor of burning horn or urine.

1. ANIMALS.

CANTHARIS.—CANTHARIDES.

Spanish flies.

Cántharis (Lyt′ta, *Fabricius*) vesicatória, *De Geer*.

Class, Insecta; *order*, Coleoptera.

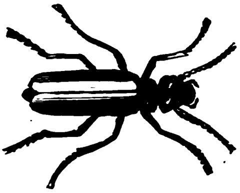
Habitat.—Southern and Central Europe, mainly upon oleaceæ and caprifoliaceæ.

Collection.—By shaking the trees or shrubs, or beating the branches in the morning, and killing the insects with hot water, or, after placing them in a well-closed vessel, with oil of turpentine, carbon disulphide, or ammonia. Yield of dry insects about 40 per cent.

Description.—From 15 to 30 millimeters (⅗–1⅕ inches) long, and 6 to 8 millimeters (¼–⅓ inch) broad; head obtusely triangular and somewhat heart-shaped, with filiform, in the upper part, black antennæ; thorax obtusely quadrangular; the flattish cylindrical body covered with the ample membranous, brownish, transparent wings, and these with the long wing-cases, which, like the other parts, are of a shining copper-green color; odor strong and disagreeable; taste acrid. They yield a grayish-brown powder, containing green, shining particles.

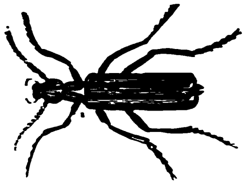
Cantharides should be thoroughly dried at a temperature of 40° C. (104° F.) and preserved in well-closed vessels. On keeping cantharides without previous drying in this manner, the addition of a little oil of turpentine, chloroform, benzol, or carbon disulphide is useful for preventing the attack of mites.

FIG. 1.



Cantharis vesicatoria.

FIG. 2.



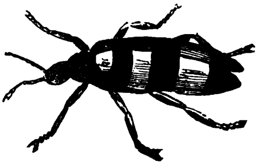
Cantharis vittata.

Constituents.—Cantharidin, $C_{10}H_{12}O_4$ (colorless scales or prisms, soluble in alcohol, ether, chloroform, fats, volatile oils, glacial acetic acid, also sparingly in water; sublimable; with alkalies yields cantharidates), also fat, odorous compound, various extractives, and salts; ash about 6 per cent.; moisture about 10 per cent.

Valuation.—The powder is exhausted with chloroform (containing some HCl) or acetic ether, the solution evaporated, fat and coloring matter removed by carbon disulphide; yield 0.4–0.7 per cent. cantharidin. It is with difficulty obtained in crystals from old cantharides; these may be treated with potassa and then with hydrochloric acid, or mixed with magnesia and water, dried, acidulated, deprived of oil by petroleum benzin, and exhausted with chloroform, etc.

Other species.—Cántharis (Epicáuta, *Fabricius*) vittáta, *Latreille*, potato fly, indigenous to the United States; wing-cases black, each with a yellow margin, and a yellow stripe along the middle; contains, when fresh, 1.3 per cent. cantharidin.

FIG. 3.



Mylabris cichorii.

Mylábris cichórii, *Fabricius*, and M. phaleráta, *Pallas*. Chinese blistering flies. Indigenous to Southern and Eastern Asia; black, wing-cases with two bands and at the base with two spots; bands and spots orange-yellow; contain 1.0–1.2 per cent. cantharidin.

Mylábris bifasciáta, from Southern Africa. About 25 millimeters (1 inch) long; black, upon the wing-cases two undulating narrow dark yellow bands; contain 1.0 to 1.09 per cent. cantharidin.

Properties.—Diuretic, aphrodisiac, acrid poison; externally, rubefacient, vesicant. *Dose*, 0.01 to 0.07 gram (gr. $\frac{1}{6}$–gr. j), mostly in form of tincture.

Antidotes.—Evacuation (stomach-pump, or emetics); demulcents (barley water, flaxseed tea—*not* oils, or oil emulsions); morphine.

COCCUS.—COCHINEAL.

Coccionella.

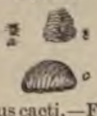
Cóccus cácti, *Linné*.

Class, Insecta; *order*, Hemiptera.

Habitat—Mexico and Central America, upon Opúntia cochinillífera, *Miller*, and other species.

Collection. — Cultivated; the wingless females, after fecundation, increase in size; they are brushed off from the plants and killed by hot water, or the heat of an oven.

FIG. 4.



Coccus cacti.—Female insect, natural size; *a*, before, and *b*, *c*, after impregnation, dry, and soaked in water.

Description. — About 5 millimeters ($\frac{1}{5}$ inch) long, oblong, angular, flat or concave beneath, and with 6 short legs, convex above, annulate and wrinkled, purplish-black or gray, yielding a dark red powder; odor faint, taste slightly bitter.

Granilla is an inferior kind, and consists of the smaller and of uncultivated insects.

Adulteration.—The silvery-gray cochineal with carbonate or sulphate of barium and lead; the black cochineal with graphites, ivory black, or manganese dioxide; on maceration in water the powders are separated.

Valuation.—Exhausting with boiling distilled water, and decolorizing the cold decoction with potassium permanganate, preferably in the presence of a little indigo-carmine.

Constituents.—About 10 per cent. of carminic acid, $C_{17}H_{18}O_{10}$ (brownish-purple, yielding a red powder; very soluble in water, alcohol, and alkalies, precipitated purple by earths; insoluble in fats and volatile oils; splits into sugar and carmine red, $C_{11}H_{12}O_7$, a vermilion-red powder, also soluble in water, alcohol, and alkalies); about 18 per cent. of wax and fat; the wax, coccerin, forms the wool-like covering of gray cochineal; the fat consists of myristin, liquid fat, and fat acids; various organic compounds; ash about 3 per cent. (not much more than 1 per cent., *Brit. Phar.*); moisture about 6 per cent.

Properties.—Stimulant, antispasmodic, diuretic, chiefly used for its coloring-matter. *Dose*, 0.06 to 1 gram (gr. j–xv).

Carmine is the precipitate obtained from the decoction of cochineal with alum or cream of tartar, and contains 50–60 per cent. of coloring-matter, the balance being moisture, nitrogen compounds, traces of wax, and some ash.

BLATTA.—COCKROACH.

Blátta (Periplanéta, *Burmeister*) orientális, *Linné*.
Class, Insecta; *order*, Orthoptera.

Habitat.—Asia, now found in most parts of the world, in kitchens and damp, warm rooms.

Description.—About 25 millimeters (1 inch) long, oblong, flat; reddish-brown or black-brown; antennæ long, filiform; head hidden beneath the prothorax; wings in the male long, in the female very short; odor very disagreeable.

Constituents.—Fetid oil, extractive, antihydropin (crystallizable, not diuretic), trimethylamine, ammonia.

Properties.—Diuretic. *Dose*, 0.3 to 0.6 gram (gr. v–x), in powder or tincture.

Other species of Blatta resemble the above in odor and perhaps in properties. *B. gigántea* of the West Indies is about 5 centimeters (2 inches) long. *B. americána* of North America is 25 to 30 millimeters (1 to 1⅕ inch) long. *B. germánica* of Central Europe is 10 to 12 millimeters (about ½ inch) long.

HIRUDO.—LEECH.

1. Sanguisúga medicinális, *Savigny;* and 2. San. officinális, *Sav.* *Class*, Vermes; *order*, Annelida; *sub-order*, Apoda; *family*, Hirudinea.

Habitat.—1. Central and Northern Europe (Swedish or German leech); 2. Southern Europe (Hungarian leech); in fresh-water ponds.

Description.—Body 7 to 15 centimeters (3 to 6 inches) long, smooth, soft, round, somewhat flattened, narrowed toward both ends, composed of 90 to 100 rings; posterior end terminated by a broad disk, anterior end by a narrower disk, in the centre with the mouth, containing 3 jaws, each with a double row of teeth; back olive-green or blackish-green, with 6 longitudinal stripes dotted with black; belly yellowish-green or olive-green —No. 1 with numerous black spots, No. 2 with a black line on each side, unspotted. No. 1 draws readily about its own weight of blood; No. 2 draws more, and a larger amount of blood will flow after the animal has fallen.

Preservation.—In clear river water in a shady place, free from noxious vapors; temperature 10° to 20° C. (50° to 68° F.); the bottom covered or the greater part of the vessel filled with pebbles, turf, moss, some charcoal.

Leeches gorged with blood should be kept by themselves, and not used for six months or more; they may be made to disgorge the blood by placing them for a short time in a solution of table salt.

Uses.—For local depletion.

2. EGGS.

OVUM.—EGG.

Origin.—Gállus Bánkiva, var. doméstieus, *Temminck*, s. Phasiánus Gállus, *Linné.* *Class*, Aves; *order*, Gallinæ.

Habitat.—Java and Cochinchina, domesticated.

The egg consists of the shell and lining membrane about 10 per cent., albumen 60, and yolk 30 per cent.

1. *Testa ovi, Egg-shell.*—Composed of 90–97 per cent. calcium carbonate, 1–5.7 calcium and magnesium phosphates, and 2–4 7 organic matter.

2. *Albumen ovi, White of egg.*—Weight 20 to 26 grams (ʒv–vjss). Contains 82–88 per cent. water and 12–18 per cent. solid constituents, mostly albumin, traces of fat, sugar, and extractive, and about 0.65 ash, of which 42 per cent. is KCl and 9 NaCl, the remainder being carbonates, phosphates, and sulphates of alkalies, calcium, magnesium, and iron.

3. *Vitellus ovi, Yolk, Yelk.*—Contains 48–55 per cent. water, 16 vitellin (a proteid related to casein, mixed with albumin), 30 fat, 1.5 inorganic salts (chlorides, sulphates, and phosphates of potassium, sodium, calcium, and magnesium),

0.42 cholesterin; also lecithin, coloring-matter, lactic acid, sugar.

Properties and Uses.—Egg-shell is antacid. White of egg is nutritious, and used for the clarification of liquids and as an antidote to metallic poisons. Yelk is nutritious, and used for emulsionizing oils and as a dressing for burns, etc.

3. ANASTOMOSING FIBROUS TISSUE.

SPONGIA.—SPONGE.

Origin.—Spóngia officinális, *Linné.* *Class*, Poriphera; *order*, Ceratospongiæ.

Habitat.—In the sea attached to rocks; sometimes planted.

Collection.—By diving and cutting, or the inferior kinds by tearing from the rocks with a forked instrument. The gelatinous animal matter is removed by exposure and washing.

Description.—A framework consisting of long, elastic, ramifying, and anastomosing fibres, and traversed by numerous smaller or larger cavities and pores; yellowish, brownish, or brown; soluble in potassa solution with evolution of ammonia; charred by heating, giving off empyreumatic ammoniacal vapors.

The best kind is the soft, cup-shaped Turkey sponge, collected on the coast of Asia Minor and Syria from Euspóngia mollíssima, *O. Schmidt.* Zimocca sponge, from Euspóngia Zimócca, *Schmidt*, coast of Greece, is flatter, harder, and less elastic. Bathing sponge, from Euspóngia équina, *Schmidt*, North African coast, is nearly spheroid and coarse. The sheeps'-wool, Bahama, Florida, and Nassau sponges are obtained from the West Indies from different varieties of the preceding species.

Constituents.—Spongin (slowly soluble in cuprammonium solutions; soluble in KHO with evolution of NH_3; yields with H_2SO_4 leucin and glycocoll [glycin]); various salts; when free from sand, etc., ash 3–4 per cent.

Uses.—For cleaning, absorbing liquids, dilating cavities (sponge tents); for preparing *burnt sponge, spongia usta*, by heat in covered vessels (yield 30–35 per cent.); contains silica, potassium and sodium chloride and bromide, calcium carbonate and sulphate, and about 1.8 per cent. of iodine, combined with sodium and potassium.

4. MEMBRANOUS TISSUE AND GELATINS.

ICHTHYOCOLLA.—Isinglass.

Colla piscium. Russian isinglass.

Origin.—Acipénser Húso, *Linné* (belugo); Ac. Güldenstäd'tii, *Brand et Ratzeburg* (osseter); Ac. ruthénus, *Linné* (sterlet); Ac. stellátus, *Pallas* (sewruga). *Class*, Pisces; *order*, Sturiones (Ganoidei, Acipenseridæ).

Habitat.—Caspian and Black Seas and tributary rivers.

Preparation.—The swimming bladder is cut, washed, deprived of the outer layer, and dried.

Description.—In separate sheets (leaf isinglass), several sheets folded together (book isinglass), or rolled and folded into various forms (staple isinglass), of horny or pearly appearance, whitish or yellowish, semi-transparent, iridescent, tough, tearing parallel with the fibres, inodorous, insipid; almost completely soluble in boiling water and in boiling diluted alcohol. The solution in 24 parts of hot water forms, on cooling, a transparent jelly.

Other kinds.—American isinglass. The sounds of Gádus merlúccius, *Linné* (hake), and Otólithus regális, *Cuvier* (weak fish), dried in thin sheets or ribbons.

Purse or pipe isinglass. Fish sounds dried without being cut open.

Japanese or Chinese isinglass (agar-agar) is prepared from Eucheúma spinósum, *Agardh*, Graciláría lichenoídes, *Agardh*, and other algæ.

Constituents.—Gelatin (glutin) with about 2 (the inferior kinds sometimes 30) per cent. of insoluble membrane; ash about 0.5 per cent.

Properties.—Emollient, nutritive, externally as a protective.

GELATINA.—GELATIN.

Preparation.—Bone cartilage, skins, tendons, and ligaments are boiled in water until dissolved, and the resulting jelly is dried in the air.

Description.—Thin, transparent sheets, or porous and opaque layers, or shreds; the solution in hot water is colorless and inodorous. Inferior kinds of gelatin are called glue. It dissolves freely in acetic acid (*liquid glue*); its aqueous solution is not precipitated by dilute acids, alum, lead acetate, and ferric salts; it is precipitated by tannin; its solution, containing $K_2Cr_2O_7$, yields an insoluble compound on exposure to light.

Composition.—Glutin contains about 50 per cent. C, 18 N, 7 H, 24 O, and 0.5 S.

Chondrin resembles gelatin; it is obtained from the cartilages of the ribs and other non-ossifying cartilages; its aqueous solution is precipitated by alum, lead acetate, ferric salts, acetic acid, and a small quantity of mineral acids; it is not precipitated by tannin or mercuric chloride.

Properties.—Emollient, slightly nutritive, externally as a protective.

5. SECRETIONS AND EXCRETIONS.

a. Friable, not Fusible.

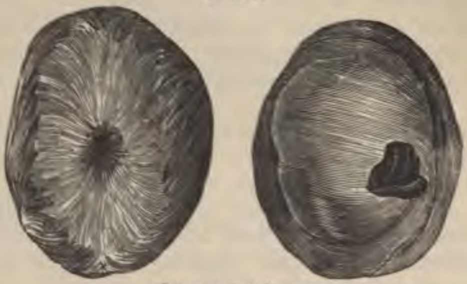
MOSCHUS.—MUSK.

Origin.—From the preputial follicles of the male animal, Móschus moschíferus, *Linné.* *Class,* Mammalia; *order,* Ruminantia; *family,* Cervidæ.

Habitat.—Central Asia.

Description.—Irregular crummy, somewhat unctuous grains, dark reddish-brown, and in the anhydrous state almost inodorous; the commercial article contains about 10 per cent. of moisture, and has a peculiar penetrating and persistent but not ammoniacal odor and bitterish taste. Musk is contained in oval or roundish sacs about 5 centimeters (2 inches) in diameter, and about 2 centimeters ($\frac{4}{5}$ inch) thick; on one side invested with a smoothish membrane, on the other side covered with stiff, appressed, grayish hairs concentrically arranged around two orifices near the centre; in the muscular coat with a portion of the thin penis. Strong alcohol dissolves about one-tenth the weight of musk; the tincture is light brownish-yellow, and on the addition of water becomes slightly turbid. Water dissolves fully one-half the weight of musk, the solution being deep brown, faintly acid, and strongly odorous. Macerated with oil of turpentine musk disintegrates, forming, when viewed under the microscope, brownish amorphous translucent particles. The secretion, freed from skin and hairs, on ignition gives off a somewhat urine-like odor, and leaves 6 to 8 per cent. of a gray ash. The odor is materially altered by camphor and oil of bitter almonds.

FIG. 5.



Chinese musk-sac.

Lower surface. Upper surface.

Varieties.—Chinese, Thibet, or Tonquin musk is the best variety. Siberian or Russian musk is sometimes scarcely inferior, but often in flat oval sacs with thin and light hairs, the secretion compact and less aromatic (Cabardine musk). Bucharian and Assam musk is in small sacs, often with portions of the hide adhering.

Constituents.—Ammonia, an acid, cholesterin, fat, wax, gelatinous and albuminous principles; ash about 8 per cent. The odorous principle has not been isolated. Camphor, hydrocyanic acid, ergot, oily seeds, etc., remove the odor of musk.

Properties.—Diffusible stimulant, aphrodisiac, antispasmodic. *Dose,* 0.06 to 0.6 gram (gr. i–x), in powder, pills, or enema.

Substitutions and Adulterations.—Artificial musk bags, having none of the characters described, or the secretion partly replaced by dried blood, resin, lead, and other substances.

Trinitro-isobutyl-methyl-benzol has a strong musk-like odor (*artificial musk*). The homologues of isobutylxylol are analogous in odor.

CASTOREUM.—Castor.

Origin.—From the preputial follicles of both the male and female animals Cástor Fíber, *Linné. Class,* Mammalia; *order,* Rodentia; *family,* Castoridæ.

Habitat.—Northern hemisphere, between 33° and 68° north latitude.

Description.—Follicles in pairs, each about 75 millimeters (3 inches) long, club-shaped or narrow pyriform, wrinkled, brown or blackish; the inner coat iridescent, glandular, and much folded; the contents brown, hard, friable, of a peculiar odor, and of a bitter, rather acrid and nauseous taste. Alcohol dissolves about one-half of the weight of castor, the tincture being of a brown color. The decoction with water has a light brownish-yellow color, becomes turbid on cooling, and acquires a dark color with ferric chloride.

Varieties.—American or Canadian Castor. Weight of follicles between 30 and 125 grams (1 and 4 oz.); the membranes adhering firmly, the contents often rather glossy. Russian or Siberian Castor. Subglobular or roundish pyriform; weight, 75 to 250 grams (2½ to 8 oz.); the outer membranes rather readily separable; the contents dull brown, of a more agreeable odor. The Russian variety is very rare, and yields a red-brown tincture, which on the addition of water becomes turbid and translucent, and clear again by ammonia water. The tincture of American castor, treated in the same manner, leaves some resin undissolved.

Constituents.—Volatile oil, containing carbolic acid, 1 to 2 per cent., bitter resinous substance 14 to 58 per cent., castorin (colorless fusible needles), salicin, cholesterin, etc.; ash about 3.5 per cent.

Adulterations.—The secretion of castor sacs from diseased animals is sometimes of a brownish-gray color, and may contain over 50 per cent. of calcium carbonate. Adulterations with earthy matters, resin, blood, etc., are rare.

Properties.—Stimulant, antispasmodic, emmenagogue. *Dose,* 0.6 to 2 grams (gr. x–xxx).

PEPSINUM.—PEPSIN.

Origin.—The mucous membrane of the stomach of the hog, Sus scrófa, *Linné* (*order*, Pachydermata), the sheep, O′vis A′ries, *Linné* (*order*, Ruminantia), or the calf, Bos Taúrus, *Linné* (*order*, Ruminantia). *Class,* Mammalia.

Habitat.—Domesticated.

Preparation.—By maceration or digestion in water and precipitation with sodium chloride.

Properties.—The dried membrane forms a light-brown powder. Precipitated pepsin is translucent brownish or brownish-yellow. Saccharated pepsin is a mixture of pepsin with milk sugar, and is an opaque, whitish or pale-yellowish powder. It is insoluble in alcohol, almost completely soluble in water (syntonin insoluble), curdles milk, and is altered by alkalies.

Test.—Digested at 38° C. (100° F.) for six hours a slightly opalescent solution is obtained from 1 saccharated pepsin, 500 water, and 7.5 hydrochloric acid, and 50 parts of hard-boiled egg-albumen.

Use.—In dyspeptic disorders. *Dose,* 0.5 to 1 gram (gr. viij–xv).

b. Fusible or Soft.

AMBRA GRISEA.—AMBERGRIS.

Origin.—Found floating on the sea; a morbid excretion in the intestines of Physéter macrocéphalus, *Linné.* *Class,* Mammalia; *order,* Cetacea; *family,* Physeteridæ.

Habitat.—Indian and Southern Pacific Oceans.

Description.—Fusible in hot water; in the cold friable, gray or brown-gray, streaked and dotted; sp. grav. 0.80 to 0.92, of a peculiar fragrance, nearly tasteless; soluble in ether, fats, volatile oils, and hot alcohol; insoluble in potassa solution.

Constituents. — Ambreïn, 85 per cent. (white, tasteless needles, fusible at 36° C.); balsamic extractive; ash a minute quantity.

Tests.—Heated upon platinum foil, no acrid vapors are evolved, and only a minute residue is left.

Properties.—Stimulant, antispasmodic. *Dose,* 0.3 to 1 gram (gr. v–xv). Mostly used in perfumery.

HYRACEUM.—HYRACEUM.

Origin.—From the Klipdas, Hy′rax capénsis, *Cuvier.* *Class,* Mammalia; *order,* Hyracoidea.

Habitat.—Southern Africa.

Description.—Black-brown, tough and plastic, partly soluble in water, less soluble in alcohol and ether; when warmed, of a castor-like odor; taste bitter, nauseous. It has been regarded by some as the dried urine, by others as the feces of the animal.

Constituents.—Volatile oil, resin, fat, various acids and salts.

Properties.—Stimulant, antispasmodic. *Dose,* 0.3 to 1 gram (gr. v–xv). Rarely employed.

CIVETTA.—Civet.

Zibethum.

Origin.—From glands in a pouch between the anus and genitals of the male and female animals. 1. Vivérra Zibétha, *Schreber,* and 2. Viv. Civétta, *Schreber. Class,* Mammalia; *order,* Carnivora; *family,* Viverridæ.

Habitat.—1. Southern Asia, and 2. Africa.

Description.—Unctuous, fresh yellowish, afterward brown, fusible; almost insoluble in water, soluble in hot absolute alcohol, partly soluble in ether; odor strong, resembling musk; taste bitterish acrid, nauseous.

Constituents.—Volatile oil, fat, resinous and coloring matters, salts.

Properties.—Stimulant, antispasmodic. *Dose,* 0.3 to 1 gram (gr. v–xv). Used in perfumery.

c. Liquid.

SANGUIS.—Blood.

Origin.—The arterial fluid of the ox, Bos Taúrus, *Linné. Class,* Mammalia; *order,* Ruminantia; *family,* Bovidæ.

Habitat.—Domesticated.

Properties.—Red, opaque; sp. grav. 1.050; odor peculiar; contains blood corpuscles in suspension; coagulates on exposure, separating the clot, cruor, from the liquid or serum. Evaporated, it forms extractum sanguinis or pulvis sanguinis.

Constituents.—Water about 78, albumin 7, fibrin 0.4, salts 0.9, corpuscles and other constituents about 13 per cent. The red color is due to hæmoglobin. The serum contains between 9 and 10 per cent. of solids, about 8 of these being albuminoids. The salts are chlorides, phosphates, and sulphates of alkalies, calcium, and magnesium.

Properties.—Restorative. *Dose* of dried blood, 0.5 to 1 gram (gr. viij–xv).

LAC.—Milk.

Lac vaccinum.

Origin.—From the mammary glands of the cow, Bos Taúrus, *Linné. Class,* Mammalia; *order,* Ruminantia; *family,* Bovidæ.

Habitat.—Domesticated.

Description.—White, opaque; sp. grav. 1.030; odor slight; taste bland and sweet.

Constituents.—Water 87, solids 13, consisting of albuminoids 4.1, fat 4.0, milk-sugar 4.2, and salts, chiefly phosphates with some chlorides, 0.7. The fat is emulsionized by the albuminoids (casein and lactoprotein).

Derivatives.—Cremor lactis, cream. The fat rising to the surface on standing, containing some albuminoids and serum.

Skim milk. The white liquid from which the cream has been removed, containing the albuminoids, sugar, and salts; taste bland.

Buttermilk, lac ebutyratum. The opaque liquid separated in churning the cream; contains the albuminoids, sugar, and salts; of a slightly acidulous taste.

Butter, Butyrum; see Fats.

Milk sugar, Saccharum lactis; see Sugars.

Whey, Serum lactis. The opalescent liquid separated from milk after removing the albuminoids and fat, either by rennet (serum lactis dulce) or by acids or acid salts (ser. lact. acidum, aluminatum, tamarindatum, etc.). It contains the sugar and salts, also the acid or salt added.

Properties.—Nutritious.

FEL BOVIS.—Ox Gall.

Fel bovinum; Fel tauri.

Origin.—From the gall-bladder of the ox, Bos Taúrus, *Linné.* *Class,* Mammalia; *order,* Ruminantia; *family,* Bovidæ.

Habitat.—Domesticated.

Description.—A viscid liquid, greenish or brownish-green; sp. grav. 1.020; neutral or faintly alkaline; odor peculiar; taste sweetish, very bitter, and nauseous; produces with sugar and strong sulphuric acid a deep red and purple color (Pettenkofer's test).

Constituents.—Water about 85–90 per cent., solids about 10 per cent., consisting of mucilage (precipitated by 2 volumes of alcohol), bilirubin (cholepyrrhin) $C_{16}H_{13}N_2O_3$, and other coloring matters, cholesterin $C_{26}H_{44}O$, lecithin, and salts, among them the sodium salts of two bitter acids, glycocholic (cholic) and taurocholic (choleic) acid; both acids give Pettenkofer's reaction, and, on being boiled with alkalies, yield cholic (cholalic) acid and, the former, glycocoll; the latter, taurin.

Derivatives.—Evaporated to the consistence of an extract (fel bovis inspissatum). Purified by precipitation with alcohol, then evaporated (fel bovis purificatum s. depuratum).

Properties.—Tonic, laxative. *Dose* (of inspissated bile), 0.3 to 1 or even 4 grams (gr. v–xv–ʒj).

6. CALCAREOUS SKELETONS AND CONCRETIONS.

Almost wholly soluble, with effervescence, in hydrochloric acid.

CORALLIUM.—CORAL.

Origin.—1. Oculína virgínea, *Lamarck*, and 2. Corállium rúbrum, *Lamarck*. *Class*, Polypiphera; *orders*, 1. Hexacoralla, and 2. Octocoralla.

Habitat.—Mediterranean and Atlantic Ocean.

Description.—Hard, cylindrical, branching pieces, with a more or less uneven, porous, and striate surface, and a radiating interior, frequently hollow; inodorous, tasteless, white (from No. 1) or red (from No. 2).

Constituents.—Animal matter 7.75, calcium carbonate 83.25, magnesium carbonate 3.50, ferric oxide 4.25 (in red coral).

Properties.—Antacid. *Dose*, 0.3 to 2 grams (gr. v–xxx). Used in tooth powders.

OS SEPIÆ.—CUTTLEFISH BONE.

Origin.—The calcareous bone of Sépia officinális, *Linné*. *Class*, Cephalopoda; *order*, Decapoda; *family*, Sepiadæ.

Habitat.—Mediterranean and Atlantic Ocean.

Description.—White, oval-oblong, 10 centimeters (4 inches) or more in length, flattened; both sides convex; outer surface smoothish, hard, the remainder porous and friable; inodorous; taste earthy, somewhat saline.

Constituents.—Animal matter, 10–15 per cent.; the remainder calcium carbonate, with little sodium chloride and traces of calcium phosphate and magnesia.

Properties.—Antacid, mostly used in tooth powders; also for polishing.

TESTA.—OYSTERSHELL.

Conchæ, s. testa ostreæ.

Origin.—The bivalved shell of Os'trea virginiána, *Lister*, and O. édulis, *Linné*. *Class*, Acephala (Conchifera, Lamellibranchia); *order*, Monomya; *family*, Ostracea.

Habitat.—Several species are found on the coast of the Atlantic and Indian Oceans.

Description.—Irregular roundish, oblong or obovate; hinge toothless; valves composed of imbricate foliaceous layers, externally rough, inner surface smooth, glossy, and white. For medicinal purposes, it is purified by boiling with water and elutriation.

Constituents.—Animal matter 0.5–4.5 per cent., the remainder calcium carbonate, with a small proportion of calcium phosphate and sulphate, magnesia, alumina, ferric oxide, and silica.

Properties.—Antacid. *Dose,* 0.3 to 2 grams (gr. v–xxx).

TESTA OVI.—EGGSHELL.

(See page 32.)

CALCULI CANCRORUM.—CRABS' STONES.

Lapides, s. lapilli, s. oculi cancrorum. Crabs' eyes.

Origin.—Concretions in the stomach of As'tacus fluviátilis, *Fabricius*, s. Cáncer As'tacus, *Linné*. *Class*, Crustacea; *order*, Decapoda; *family*, Astacida.

Habitat.—Northern temperate zone, in rivers.

Description.—Circular, 3 to 10 millimeters ($\frac{1}{8}$ to $\frac{3}{8}$ inch) in diameter; plano-convex; the upper side with a concentric groove; white, hard; in boiling water rose-red; effervescing with hydrochloric acid, leaving a cartilaginous plano convex mass; inodorous, tasteless.

Constituents.—Animal matter, 12–15 per cent.; calcium carbonate, 63; calcium phosphate, 17; the remainder, magnesium phosphate and sodium salts.

Properties. Antacid. *Dose*, 0.3 to 2 grams (gr. v–xxx).

Substitutions.—Factitious crabs' stones, treated with hydrochloric acid, leave little or no residue.

OS.—BONE.

Origin.—The skeleton of vertebrate animals.

Description.—White, smooth, internally more or less porous, insoluble in water, soluble in hydrochloric acid with some effervescence, leaving a gelatinous mass.

Constituents.—40 to 67 per cent. of calcium phosphate, including 5 to 10 per cent. of calcium carbonate, 1 to 2 per cent. of magnesium phosphate, and other salts. The organic ossein yields gelatin on being boiled with water. On dry distillation Dippel's animal oil is obtained, containing pyrodine, picoline, and other bases.

Uses.—For preparing boneblack (animal charcoal) and phosphates.

PART II.

CELLULAR VEGETABLE DRUGS.

THESE consist of plants and parts of plants—all being composed of one or more kinds of cells.

1. ROOTS.—RADICES.

A root is the descending axis of a plant, and resembles the ascending axis or stem, but is destitute of leaves, and consequently does not branch by the growth of axillary buds. The pith found in the stem of dicotyledons usually descends only a short distance into the main or tap root, and the epidermis of even young roots becomes uneven and obliterated by the formation of cork; with these exceptions, the tissues of the root and their arrangement resemble those of the stem. Roots are destitute, or nearly so, of chlorophyll.

Annual roots, separated from the other portions of the plant, are not employed in medicine; the officinal roots derived from biennial or perennial herbs emanate from a short crown (base of stem) bearing leaf scars and producing buds, the crown being several- or many-headed in perennial roots; the roots of shrubs and trees are destitute of such a crown. In the monocotyledons the tap root is commonly not developed, but in its place appear a number of adventitious roots (rootlets) of about equal thickness and length, and usually not branched, though frequently beset with fibres. Adventitious roots are also met with in dicotyledons, and emanate, as in the monocotyledons, from the base or other parts of the stem, or from the rhizome. But the dicotyledonous roots which are medicinally employed consist generally of the main or tap root and its branches—in some cases of the latter alone. The branches at their base are often but little thinner than the main root from which they emanate, and, like the latter, are tapering toward the tip.

Histology.—The rootlets of monocotyledons (see Sarsaparilla) consist, under the epidermis, of a circle of parenchyme, which is followed by the nucleus sheath or endoderm, formed of one or sometimes two rows of thick-walled cells, and inclosing an irregular circular layer, containing a few or numerous small fibro-vascular bundles, which are never arranged in wedge-shaped rays; the centre of the rootlets is often occupied by parenchyme tissue, similar in character to that of the outer layer.

The roots of dicotyledons consist of bark, the outer layer of which is cork, followed by parenchyme, and an inner layer, rarely containing bast fibres and usually traversed by more or less distinct medullary rays. A cambium layer containing the newly formed cells and indicated in the dried root as a dark line, separates the bark from the wood, the bundles of which are wedge-shaped, and separated from one another by medullary rays. The central pith is mostly minute or nearly wanting, except in the upper part, and occasionally for some distance in the main root; in the latter case it becomes considerably thinner toward the tip.

Classification.

Sect. 1. Monocotyledonous Roots (Rootlets).	
Orange-brown; outer layer mealy or horn-like; taste acrid.	Sarsaparilla.
Pale brownish; outer layer spongy; taste pungently aromatic.	Vetiveria.
Sect. 2. Dicotyledonous Roots (Tap roots and branches).	
I. Fleshy roots: wood either soft or wood bundles thin, with broad medullary rays.	
1. Free from starch and inulin.	
Taste acrid; externally keeled; wood not cylindrical.	Senega.
red-brown; wood yellowish, not radiate.	Saponaria.
light brownish-gray; wood whitish, radiate.	Saponaria levantica.
Taste bitter; wood bundles thin; inner bark radiate; yellowish-brown.	Gentiana.
pale orange-brown.	Frasera.
Taste mucilaginous; externally brown-black.	Symphytum.
2. Free from starch, but containing inulin.	
Taste bitter; laticiferous vessels in bark forming concentric circles.	Taraxacum.
laticiferous vessels in bark in radiating lines.	Cichorium.
Taste acrid; burning; resin cells forming concentric circles in bark and medullary rays.	Pyrethrum.
resin cells in bark only (root thin).	Pyrethrum German.
Taste aromatic; resin cells numerous, scattered; wood bundles small.	Inula.
Taste mucilaginous and bitter; neither resin cells nor milk vessels; wood and bark radiate.	Lappa.
3. Containing starch.	
a. With laticiferous vessels in bark.	
Cork orange-brown; bark thin; laticiferous vessels few.	Asclepias tuberosa.
Light brown; subcylindrical; bark thick, wood porous, yellowish.	Apocynum cannabinum.
Pale yellowish-brown; subcylindrical; internally white.	Euphorbia ipecacuanha.
Cork blackish; internally whitish.	Euphorbia corollata.
Gray-brown; internally pinkish; scattered resin cells.	Stillingia.

b. With radiating rows of resin cells in bark.	
Root-stock short, divided into numerous long rootlets; resin cells large.	Angelica.
Root nearly simple, with several stout branches; resin cells small.	Angelica triquinata.
with several long branches; resin cells small.	Levisticum.
(brown cork removed) whitish; wood white.	Laserpitium.
brown-yellow; wood yellow, porous in branching rays.	Pimpinella.
brownish-yellow; resin cells in numerous approximate rows.	Petroselinum.
brown-gray; resin cells irregular in thin bark and thick pith; wood bundles small.	Imperatoria.
In sections; tough; resin cells in irregular rows; wood bundles irregularly matted.	Sumbul.
c. Resin cells not radiating.	
Tuberous, napiform; resin cells in broad and narrow concentric circles.	Jalapa (see Tubers).
Roots forked below; yellowish; resin cells in bark in concentric circles.	Panax.
Root large, nearly simple; brown-gray; internally whitish; resin cells scattered.	Ipomœa pandurata.
d. Neither resin cells nor laticiferous vessels.	
Very pungent; cylindrical; used fresh.	Armoracia.
Taste acrid; grayish; wood wedges short, numerous, in several circles.	Phytolacca.
Taste bitter; grayish-white; wood bundles small, in numerous circles, and forming many rays; usually in disks.	Bryonia.
Taste mucilaginous, bitter, and astringent; grayish; wood bundles irregular; mostly in disks and sections.	Nymphæa.
Taste sweetish, acrid, and bitter; cork gray-brown; internally whitish, no bast fibres; wood yellow, porous.	Belladonna.
Taste mucilaginous, insipid; (brown cork removed) white, with long bast fibres.	Althæa.
Taste sweetish, slightly acrid; deep red; thin or in powder; red color soluble in water.	Rubia.

Taste slight; bark scaly, friable, dark purple; red color insoluble in water.	Alkanna.
Taste astringent; purplish-brown; internally reddish.	Heuchera.
Taste mucilaginous and bitter:	
In sections; grayish and pale yellow; wood bundles in distant circles.	Calumba.
Fusiform, yellowish-brown; medullary rays reddish.	Rumex.
Fusiform, brown-red; medullary rays red.	Rhaponticum.
Sections; marbled by interrupted and interwoven red medullary rays, radiate near cambium.	Rheum.
II. Woody roots: wood firm and medullary rays narrow.	
Taste sweet; color tawny-yellow internally.	Glycyrrhiza.
inner bark whitish and with laticiferous vessels.	Hemidesmus.
Taste bitterish and sweetish; color yellowish internally.	Abrus.
Taste sweetish and pungent; externally pale brown.	Hydrangea.
Taste pungent; externally grayish-brown; wood-wedges narrow.	Methysticum.
Taste bitter, nauseating; bark annulate.	Ipecacuanha.
bark more or less annulate, resin-dotted.	Gillenia (see Rhizomes).
bark wrinkled, contains milk vessels.	Apocynum androsæmifolium.
Taste bitter, aromatic; bark thin, light brown; wood yellowish-white, hard.	Gelsemium.
Taste spicy; wood pale, reddish-brown.	Sassafras (see Woods).
Taste bitter; wood in irregularly concentric circles, pale brown.	Pareira.
wood yellow; bark foliaceous, loose, yellow.	Berberis.
bark firm, yellow.	Berberis aquifolium (see Rhizomes).
Taste bitterish, somewhat acrid; brown; wood white, indistinctly rayed.	Baptisia.
Taste astringent; reddish-brown; wood-wedges narrow, yellowish.	Statice.
rust-brown; wood reddish.	Ceanothus.
rust-brown or purplish-brown; wood brownish.	Krameria.

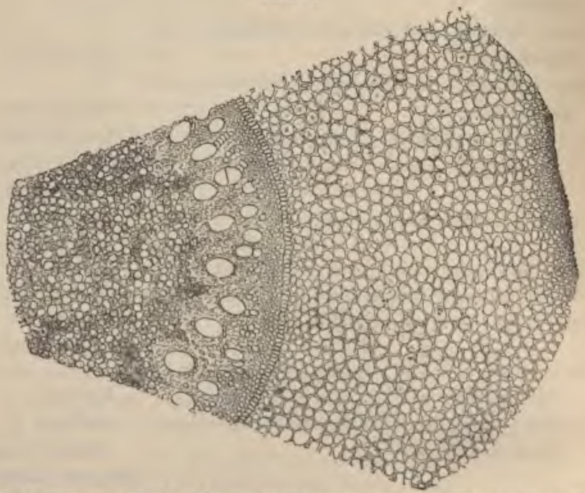
SARSAPARILLA.—SARSAPARILLA.

Origin.—Smílax officinális, *Kunth*, S. papyrácea, *Poiret*, S. médica, *Schlechtendal*. *Natural order*, Liliaceæ, Smilaceæ.

Habitat.—Tropical America from Mexico to Brazil.

Description.—Very long, cylindrical, about 5 millimeters ($\frac{1}{5}$ inch) thick, longitudinally wrinkled, grayish-brown or orange-brown externally, white and mealy or somewhat horny internally, with a circular zone of wood-bundles around a central layer of parenchyme (pith); nearly inodorous; taste mucilaginous, bitterish, acrid. The thick woody, knotty rhizome, if present, should be removed.

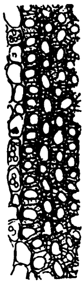
FIG. 6.



Mexican sarsaparilla.—Transverse section, microscopic appearance.

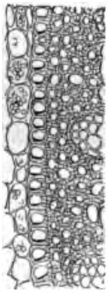
Structure.—Epidermis, subcuticular layer (2 or more rows of cells with thickened walls), parenchyme (cortical layer), nucleus sheath (1 row of thick-walled cells), wood zone, and central parenchyme (pith). The parenchyme contains compound starch granules or pasty starch, numerous cells with raphides of calcium oxalate, and few resin cells.

Fig. 7.



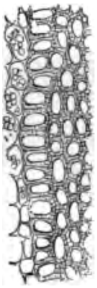
Honduras sarsaparilla.

Fig. 8.



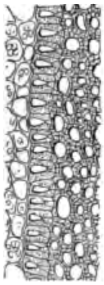
Mexican sarsaparilla.

Fig. 9.



Rio Negro sarsaparilla.

Fig. 10.



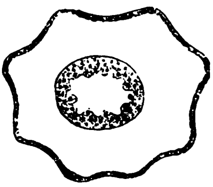
Jamaica sarsaparilla.

Sections through and near nucleus sheath, magnified 80 diam.

Varieties.—*a.* Non-mealy sarsaparillas. Starch mostly pasty; rarely in granules.

1. *Mexican sarsaparilla,* in part from *Smilax médica.* The long roots folded back over the rhizome, to which portions of the stem are often attached. Roots deeply wrinkled, with some fibres, brown-gray from adhering earth; woody and medullary zones nearly equal in width, and about half as broad as the cortical layer; nucleus sheath with the cells radially elongated, the inner cell-walls thickest. In the market as *Vera Cruz* and *Tampico sarsaparilla.*

Fig. 11.

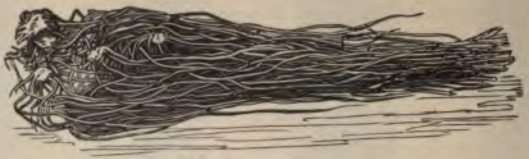


Mexican sarsaparilla, magnified 3 diam.

2. *Jamaica sarsaparilla,* from Smílax ornáta, *Hooker.* In loose bundles with or without the rhizome; resembles

the preceding, but has more fibres attached (*bearded sarsaparilla*), and surface usually more of a red tint, and less deeply wrinkled; medullary and cortical layers broader than the woody zone. Caracas sarsaparilla is probably derived from *Smílax officinális.*

FIG. 12.

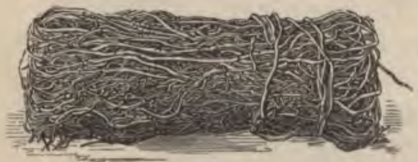


Mexican sarsaparilla.

b. Mealy sarsaparillas. Starch in granules, occasionally pasty.

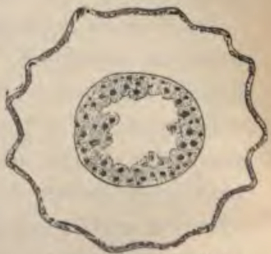
3. *Honduras sarsaparilla,* probably from *Smílax officinális.* In subcylindrical bundles, tied with a root and rounded at the ends by the roots being folded back. Roots rather finely wrinkled, with few fibres, brown or gray-brown from adhering earth. Cortical and medullary layers and woody zone about alike in thickness, or the latter some-

FIG. 13.



Jamaica sarsaparilla.

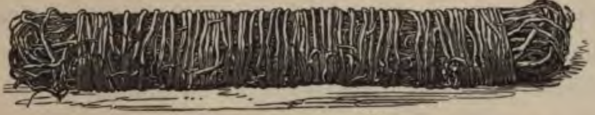
FIG. 14.



Jamaica sarsaparilla, magnified 4 diam.

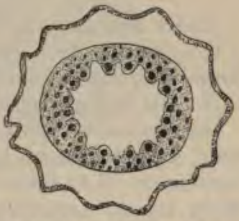
what thinner; cells of the nucleus sheath nearly square, with large apertures, and the cell-walls evenly thickened.

FIG. 15.



Honduras sarsaparilla.

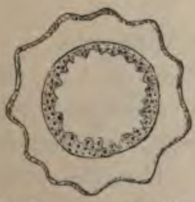
FIG. 16.



Honduras sarsaparilla, magnified 3 diam.

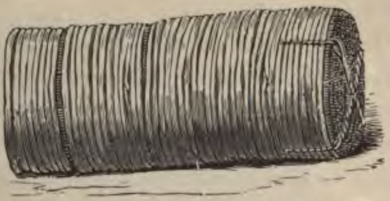
4. *Rio Negro sarsaparilla* (also called *Para* and *Lisbon sarsaparilla*); probably mainly from *Smílax papyrácea.* In large cylindrical rolls, neatly tied with the stem of a climbing plant, and evenly cut off at both ends. Roots finely wrinkled, dark brown or blackish-brown from adhering earth; cortical layer thick; woody zone narrow; medullary layer as broad as the cortical layer, or broader; cells of the nucleus sheath somewhat radially elongated, the inner cell-walls thickest, the aperture small.

FIG. 17.



Rio Negro sarsaparilla. Section, magnified 3 diam.

FIG. 18.



Rio Negro or Para sarsaparilla; portion of bundle.

Constituents.—Parillin (smilacin, parillic acid) about 0.2 per cent., trace of volatile oil, starch, resin, coloring matter, calcium oxalate, and other salts. Parillin is soluble in hot water and in alcohol, insoluble in ether, has an acrid taste, is a glucoside, and closely resembles saponin. When quite pure it crystallizes in scales; boiled with dilute acids it is split into sugar and parigenin, crystallizing in scales from alcohol.

Medical properties.—Regarded as an alterative. *Dose,* 2 to 8 grams (ʒss–ʒij).

VETIVERIA.—Vetivert.

Radix Ivarancusæ.

Origin.—Andropógon muricátus, *Retzius.* *Natural order,* Gramineæ, Andropogoneæ.

Habitat.—East India.

Description.—Rootlets emanating from a short, thin rhizome, light yellowish-brown, somewhat waxy, about 15 to 20 centimeters (6 to 8 inches long), about 1 millimeter ($\frac{1}{25}$ inch) thick, tough, aromatic, balsamic. The bark has large air-passages, and a number of resin cells.

Constituents.—Volatile oil and resin.

Medical properties.—Tonic, stimulant; almost exclusively used in perfumery for sachet powders, etc.

SENEGA.—Seneka.

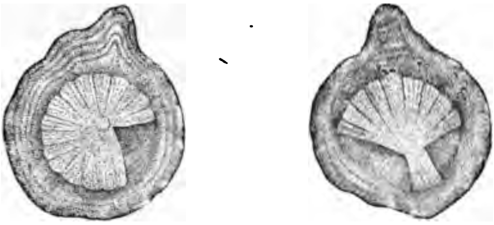
Origin.—Polyg′ala Sénega, *Linné.* *Natural order,* Polygaleæ.

Habitat.—United States, westward to Minnesota.

Description.—About 10 centimeters (4 inches) long, with a very knotty crown, bearing numerous short stem remnants with scaly leaves, and divided into a few branches from 5 to 10 millimeters ($\frac{1}{5}$–$\frac{2}{5}$ inch) thick; branches spreading, tortuous, wrinkled, somewhat fissured transversely and keeled when dry, fleshy and round after having been soaked in water; externally, yellowish-gray or brownish-yellow; fracture short; bark whitish within, sweetish, afterward acrid, inclosing an irregular porous, yellowish, less acrid or nearly tasteless wood; odor slight, but unpleasant.

A northern variety of Polygala Senega yields a larger, thicker, and less tortuous root, which is usually of a darker color than described above, and has a less prominent keel, or is sometimes nearly keel-less.

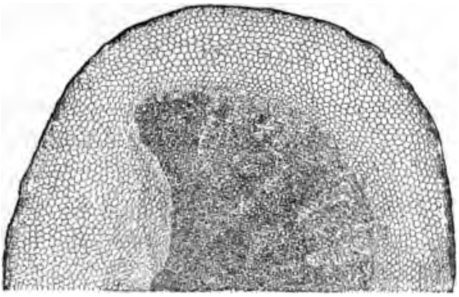
FIG 19.



Senega.—Transverse sections, magnified.

Structure.—Bark thick; the small celled inner bark present on only one side, taking the place of more or less of the outer bark, and on drying forming the keel; no bast fibres present; wood circular near the crown, below consisting of various shaped segments and rays; medullary rays delicate.

FIG. 20.

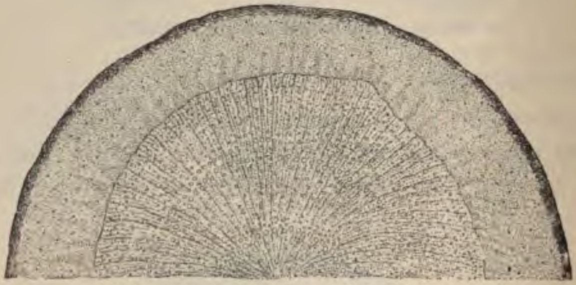


Senega root, magnified 18 diam.

Constituents.—Polygalic acid, senegin, fixed oil (containing virginic acid), little volatile oil (methyl salicylate), pectin, sugar, coloring matter. Polygalic acid is sparingly soluble in alcohol, insoluble in ether or chloroform, and is precipitated by lead acetates. Senegin has a neutral reaction, is nearly insoluble in cold absolute alcohol, is not precipitated by normal lead acetate, and yields sapogenin. (Kobert, 1887.) Exhausting the root with 60 per cent. alcohol, concentrating and precipitating with alcohol and ether, yields 5 per cent. of crude senegin.

Substitution.—White or false senega. Collected west of the Mississippi River from Polyg′ala álba, *Nuttall.* The root is usually 5 or 6 millimeters ($\frac{1}{5}$ or $\frac{1}{4}$ inch) thick, and closely resembles senega root, but has descending, scarcely spreading branches, a lighter, internally white, color, is destitute of the keel, and has a cylindrical wood. It contains about 3 per cent. of polygalic acid, and yields a light-colored infusion and tincture. The root of Polygala Boykinii, *Nuttall*, of the Southern States, is thin, but otherwise resembles the preceding, and has similar properties.

FIG. 21.



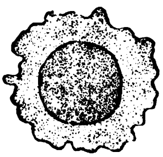
False senega root, magnified 10 diam.

Admixtures.—Ginseng root and the rhizomes and roots of Gillenia and of Cypripedium are sometimes present from careless collection; the rootlets of American species of Gentiana, and in Europe the subterraneous portion of Cynánchum Vincetóxicum, *R. Brown*, have been used for adulteration; all are easily distinguished from senega root.

Properties.—Expectorant, emetic, somewhat diuretic. *Dose*, 0.2 to 1.5 grams (3 to 22 grains).

SAPONARIA.—SOAPWORT.

FIG. 22.



Saponaria.
Transv. sec. 3 diam.

Origin.—The root of Saponária officinális, *Linné. Natural order*, Caryophylleæ, Sileneæ.

Habitat.—Central and Southern Europe, naturalized in North America.

Description.—About 25 centimeters (10 inches) long, 2 to 5 millimeters ($\frac{1}{12}$ to $\frac{1}{5}$ inch) or more in thickness, nearly cylindrical, longitudinally wrinkled, light rust-brown, internally whitish, with a rather thick bark containing numerous small white crystal cells, and a pale yellow meditullium, with indistinct medullary rays; inodorous; taste sweetish, somewhat bitter, persistently acrid.

The subterranean runners are, to some extent, present in the commercial drug; they resemble the root branches, but have somewhat thickened internodes, and have the same properties.

Old woody roots are rarely collected.

Constituents.—Saponin 4 to 5 per cent., mucilage, a little resin. Saponin $C_{32}H_{54}O_{18}$, is a white powder, sternutatory, soluble in hot water and alcohol, the aqueous solution foaming like soap water; by acids it is split into sugar and crystallizable *sapogenin*, which is sparingly soluble in water.

Properties.—Alterative, resembling sarsaparilla.

SAPONARIA LEVANTICA.—LEVANT SOAPROOT.

Origin.—The root of Gypsóphila Arróstii, *Gussone*, and G. paniculáta, *Linné. Natural order*, Caryophylleæ, Sileneæ.

Habitat.—Italy to Asia Minor.

Description.—Simple, 25 to 40 centimeters (10 to 16 inches) long, 2 to 5 centimeters (¾ to 2 inches) thick, somewhat fusiform, with longitudinal wrinkles and transverse ridges; light brownish-gray, internally whitish, with a thickish bark and a whitish meditullium containing numerous medullary rays, and rather narrow wood-wedges; inodorous; taste sweetish, persistently acrid.

Constituents and Properties.—Sapotoxin 8.5 per cent., a glucoside yielding sapogenin (Kruskal, 1891), otherwise similar to the preceding; mostly used in washing silks and other fabrics.

GENTIANA.—GENTIAN.

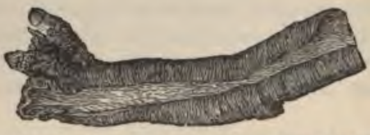
Radix gentianæ rubræ.

Origin.—Gentiána lútea, *Linné;* also G. purpúrea, G. pannónica, and G. punctáta, *Linné. Natural order*, Gentianeæ, Swertieæ.

Habitat.—Mountains of Central and Southern Europe.

Description.—In nearly cylindrical pieces or longitudinal slices, about 15 to 20 centimeters (6 to 8 inches) long and about 25 millimeters (1 inch) thick, the head closely annulate, the lower portion longitudinally wrinkled; externally deep yellowish-brown, internally lighter; somewhat flexible and tough when damp; rather brittle when dry; fracture short, indistinctly radiate; odor peculiar, faint, more prominent when moistened; taste sweetish, persistently bitter.

FIG. 23.



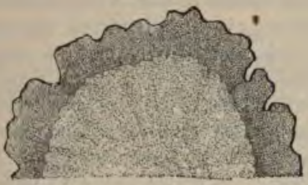
Gentian root, longitudinally sliced: about one-half natural size.

The root of G. purpurea is shorter, thinner, and darker;

that of G. pannonica is scarcely annulate, shorter, and darker; that of G. punctata little annulate, lighter, otherwise like the officinal root; they have the same properties.

Structure.—Bark rather thick, by a blackish cambium line separated from the somewhat spongy meditullium; medullary rays indistinct, narrow, of about the width of the vascular rays; bast fibres and wood fibres are wanting.

FIG. 24.



Gentian.—Transverse section, magnified 3 diam.

Constituents.—Gentiopicrin 0.1 per cent., gentisic acid (gentisin), uncrystallizable sugar about 14 per cent., pectin, fixed oil 6 per cent., ash about 8 per cent. Gentiopicrin is an amorphous or crystalline glucoside, freely soluble in water and alcohol, and yields amorphous bitter gentiogenin. Gentisic acid, $C_{14}H_{10}O_5$, crystallizes in yellow, tasteless needles, is somewhat soluble in alcohol and ether, and colors ferric salts dark brown; and a dark green color is produced by a principle which is precipitated by water from the alcoholic tincture. The pectin compound is precipitated by lead acetate. Gentianose, the sugar present in the fresh root, crystallizes in scales and is fermentable, but does not reduce Fehling's solution.

Properties.—Tonic. *Dose*, 0.3 to 2 grams (gr. v–xxx).

The *American gentian root*, collected from Gentiána pubérula, *Michaux*, G. Saponária, *Linné*, and G. Andréwsii, *Grisebach*, consists of a scarcely annulated head about 12 millimeters (½ inch) long and 3 millimeters (⅛ inch) thick, and numerous nearly simple, light brown-yellow, wrinkled rootlets about 6 centimeters (2½ inches) or more long, and having a thick whitish bark and thin meditullium; odor and taste like those of gentian.

FRASERA.—AMERICAN COLUMBO.

The root of Frásera Wálteri, *Michaux*, F. carolinénsis, *Walter*. *Natural order*, Gentianeæ, Swertieæ.

Habitat.—United States in the Alleghanies and westward.

Description.—Mostly in longitudinal slices, about 25 millimeters (1 inch) thick, the upper portion annulate, the lower portion longitudinally wrinkled, externally pale orange-brown, internally light yellowish-brown; the bark thick, overlapping on the edges, by a brown cambium line separated from the rather spongy meditullium; odor gentian-like, more prominent when moistened; taste sweetish and bitter.

Constituents.—The same as gentian, but apparently less gentiopicrin. The yellow crystalline principle differs from gentisic acid in solubility, and in the higher melting-point.

Properties.—Tonic. *Dose*, 1 to 2 grams (gr. xv–xxx). The recent root is said to be emetic and purgative.

SYMPHYTUM.—COMFREY.

The root of Sym′phytum officinále, *Linné*. *Natural order*, Boragineæ, Borageæ.

Habitat.—Europe, cultivated and spontaneous in the United States.

Description.—About 15 centimeters (6 inches) long, 1 to 2 centimeters (⅗ to ⅘ inch) thick, deeply wrinkled, brown-black, internally somewhat horny, whitish or, when old, gray; the dry root hard; fracture short, showing a thickish bark, short narrow wood-bundles, broad medullary rays, and in the upper part a thin pith; inodorous, taste sweetish, mucilaginous, and faintly astringent.

Constituents.—Mucilage, sugar, a little tannin, few starch granules, and a small quantity of asparagin.

Properties.—Demulcent, somewhat astringent. *Dose*, 8 to 15 grams (ʒij–iv) per day.

TARAXACUM.—Dandelion.

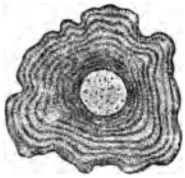
Origin.—Taráxacum Deus-leónis, *Desfontaines*, s. T. officinále, *Weber*, s. Leóntodon Taráxacum, *Linné*. *Natural order*, Compositæ, Cichoriaceæ.

Habitat.—Grassy places and roadsides in Europe, naturalized in North America. Collected in the autumn.

Nearly cylindrical, 10 to 30 centimeters (4 to 12 inches) long, above about 25 millimeters (1 inch) thick, crowned with several short thickish heads, little branched, longitudinally wrinkled, externally gray-brown, internally white with a yellowish centre, when dry breaking with a short fracture; inodorous, bitter. It should be free from chicory root.

Structure.—Bark thick, white, consisting of parenchyme, and containing numerous concentric brown circles, formed by laticiferous ducts. Meditullium yellowish, porous. Medullary rays wanting.

Fig. 25.



Transverse section of taraxacum root.

Constituents.—Early in spring dandelion contains uncrystallizable sugar, which diminishes during the summer; in autumn it contains about 24 per cent. of inulin; pectin is also present. The milk-juice contains the crystalline bitter principle taraxacin, resin, a glutinous body, and taraxacerin, $C_8H_{16}O$, a wax-like body, which in alcoholic solution has an acrid taste. Taraxacin is soluble in water and alcohol.

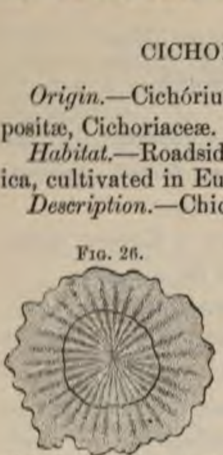
Properties.—Deobstruent, tonic in hepatic disorders, on continued use deranging digestion. *Dose*, 2 to 8 grams (ʒss–ij).

CICHORIUM.—Chicory, Succory.

Origin.—Cichórium In'tybus, *Linné.* *Natural order,* Compositæ, Cichoriaceæ.

Habitat.—Roadsides in Europe, naturalized in North America, cultivated in Europe.

Fig. 26.



Cichorium.—Transverse section.

Description.—Chicory bears a close resemblance to dandelion; but the root of wild plants is usually lighter in color and more woody, and has a relatively thinner bark. It, like the more fleshy and darker cultivated root, is readily distinguished by the radiating arrangement of the laticiferous vessels in the bark.

Constituents.—Bitter principle, inulin, pectin, sugar.

Properties.—Deobstruent, tonic, in overdoses deranging digestion.

Dose, 1 to 4 grams (gr. xv–ʒj). The roasted root is used for adulterating coffee.

PYRETHRUM.—Pellitory.

Radix pyrethri romani. Roman pellitory.

Origin.—Anacy'clus Pyréthrum, *De Candolle.* *Natural order,* Compositæ, Anthemideæ.

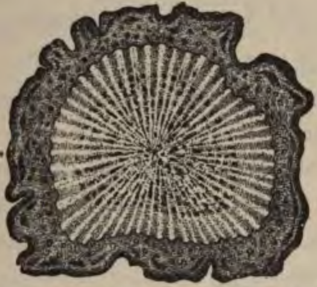
Habitat.—Highlands of Northern Africa.

Description.—Somewhat fusiform, nearly simple, 5 to 10 centimeters (2 to 4 inches) long, about 12 millimeters ($\frac{1}{2}$ inch) thick, annulate above, deeply longitudinally wrinkled below, externally dark gray-brown, internally brownish-white, fracture short. Inodorous, pungent, and very acrid.

Structure.—Bark rather thick, containing two circles of shining axially elongated resin ducts; wood-wedges slender, yellowish; medullary rays slender, with about four circles of shining resin ducts.

Constituents.—Acrid brown resin and acrid fixed oils, one brown and soluble in potassa, the other yellow and insoluble in potassa; inulin about 50 per cent., trace of tannin, mucilage; pyrethrine (?).

Fig. 27.



Pyrethrum.—Transverse section, magnified 3 diam.

Properties.—Irritant, rubefacient, sialagogue. *Dose*, as a masticatory 2 to 4 grams (ʒss–j).

PYRETHRUM GERMANICUM.—German Pellitory.

Radix pyrethri germanici.

Origin.—Anacy'clus officinárum, *Hayne.* *Natural order*, Compositæ, Anthemideæ.

Habitat.—Central Europe, cultivated in Thuringia, Germany.

Description.—Nearly simple, about 5 centimeters (2 inches) long, about 3 millimeters (⅛ inch) thick, almost filiform toward the tip, finely wrinkled, brown-gray, brittle, internally brownish; odor slight; taste acrid, burning. In commerce it is usually found with the thin, almost tasteless stem, which should be separated.

Fig. 28.

Pyrethrum germanicum.—Transverse section, magnified 3 diam.

Structure.—Bark rather thick, in the outer layer one circle of distinct resin ducts; wood-wedges very slender, soft.

Constituents.—Acrid resin, fixed oil, inulin, bitter principle.

Properties.—Like Roman pellitory.

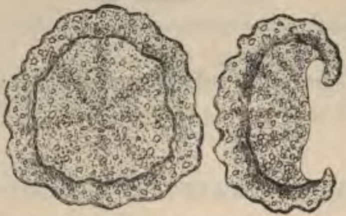
INULA.—ELECAMPANE.

Radix inulæ s. enulæ.

Origin.—I'nula Helénium, *Linné. Natural order*, Compositæ, Inuloideæ.

Habitat.—Central and Southern Europe, and eastward to Central Asia; spontaneous in the United States; cultivated.

FIG. 29.



Inula.—Transverse section, natural size.

Description.—Branches of the root 15 to 30 centimeters (6 to 12 inches) long, and 2 to 2.5 centimeters (¾ to 1 inch) in diameter; in commerce nearly always in transverse concave slices or longitudinal sections with overlapping bark, externally wrinkled and brown, flexible in damp weather, when dry breaking with a short, somewhat horny fracture, internally grayish, slightly radiate and dotted; odor peculiar, aromatic; taste bitterish, camphoraceous, aromatic.

Structure.—Bark thickish, with several irregular circles of resin ducts; wood-bundles small, forming many narrow wedges; medullary rays broader, containing numerous resin ducts.

Constituents.—Acrid resin, helenin, inulin, bitter extractive, wax, etc.; odor and camphoraceous taste are due to the volatile oil, containing alantol (inulol), $C_{20}H_{32}O$, having a peppermint-like odor and taste, and alantic (inulic) anhydrid, $C_{15}H_{20}O_2$, which is in needles and slightly camphor-like; helenin, C_6H_8O, is insipid.

Properties.—Stimulant, diaphoretic, diuretic, expectorant, externally rubefacient. *Dose*, 2 to 8 grams (ʒss–ij) in infusion.

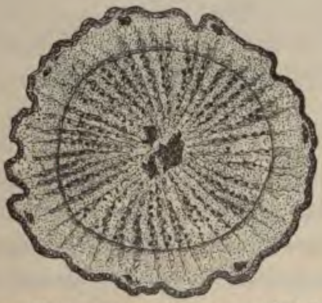
LAPPA.—Burdock.

Radix bardanæ s. lappæ.

Origin.—A′rctium Láppa, *Linné*, s. Láppa officinális, *Allioni*. *Natural order*, Compositæ, Cynaroideæ.

Habitat.—Europe and Northern Asia, naturalized in North America in waste places.

Fig. 30.



Lappa.—Transverse section, magnified 2 diam.

Description.—Nearly simple, fusiform, 30 centimeters (12 inches) or more long; above about 25 millimeters (1 inch) thick, fleshy, longitudinally wrinkled, crowned with a tuft of whitish, soft-hairy leaf-stalks; gray-brown, internally paler; fracture short; odor feeble, unpleasant; taste mucilaginous, sweetish, and somewhat bitter.

Structure.—Bark rather thick, without bast fibres, the inner part and the meditullium radially striate, the parenchyme often with cavities lined with snow-white remains of tissue; medullary rays rather broad; vascular rays narrow, porous, destitute of wood-fibres.

Constituents.—Mucilage, sugar, inulin, bitter extractive, little tannin and resin; fat 9 per cent.; possibly a glucoside (olive-green by Fe_2Cl_6); ash 3 to 4 per cent. In autumn and early spring the root of one year's growth contains about 45 per cent. of inulin.

Properties.—Diaphoretic, diuretic, alterative. *Dose*, 2 to 8 grams (ʒss–ij) in decoction.

ASCLEPIAS TUBEROSA.—Pleurisy Root.

Asclepias, *U. S. P.*

Origin.—Asclépias tuberósa, *Linné.* *Natural order*, Asclepiadeæ, Cynancheæ.

Habitat.—United States near the Atlantic coast.

Description.—Root large and fusiform, dried in longitudinal or transverse sections from 2 to 15 centimeters ($\frac{3}{4}$ to 6 inches) long, and about 20 millimeters ($\frac{3}{4}$ inch) or more in thickness, the head knotty, and slightly but distinctly annulate, the remainder longitudinally wrinkled; externally orange-brown, internally whitish; fracture uneven, tough; inodorous; taste bitterish and somewhat acrid. When long kept, pleurisy root acquires a gray color.

Structure.—Bark thin, in two distinct layers, the inner one whitish; wood yellowish and porous, with broad white medullary rays.

Constituents.—Crystalline glucoside possessing the taste of the root, soluble in alcohol, ether, and somewhat in water, precipitated by tannin; apparently identical with that of *Asclépias cornúti.* Also two resins, tannin (?), mucilage, starch, etc.

Properties.—Sudorific, expectorant, carminative, anodyne. *Dose,* 1 to 4 grams (gr. xv–ʒj).

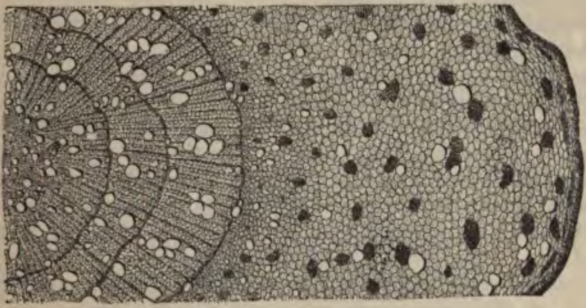
APOCYNUM CANNABINUM.—Canadian Hemp.

Apocynum, *U. S. P.*

Origin. — Apócynum cannábinum, *Linné.* *Natural order,* Apocynaceæ, Echitideæ.

Habitat.—United States, on the border of thickets and in grassy places.

Fig. 31.



Apocynum cannabinum.—Transverse section, magnified 25 diam.

Description.—Long, cylindrical, branched, about 6 millimeters (¼ inch) thick, pale brown-gray, longitudinally wrinkled; somewhat fissured; fracture short, white, and pale yellow; inodorous, bitter. The bitter taste resides chiefly in the bark, which constitutes about 65 per cent. of the root. This drug is sometimes sold in place of Apocynum androsæmifolium.

Structure.—Bark thick, covered with a thin cork layer, and containing many scattered laticiferous vessels, and in the inner layer numerous narrow medullary rays; wood yellow, soft, porous, consisting of several circles and radiate by fine medullary rays.

Constituents.—Tannin, resin, apocynin (sparingly soluble in water), apocynein (freely soluble in water), bitter extractive, starch, etc.; ash, 10 to 12 per cent.

Properties.—Emetic, cathartic, expectorant, diuretic, antiperiodic. *Dose*, as an antiperiodic and diuretic, 0.3 gram (gr. iv–v); as an emetic, 1 to 2 grams (gr. xv–ʒss).

EUPHORBIA IPECACUANHA.—IPECACUANHA SPURGE.

American Ipecac.

Origin.—Euphórbia Ipecacuánha, *Linné.* *Natural order*, Euphorbiaceæ, Euphorbieæ.

Habitat.—United States, in sandy soil, not far from the Atlantic coast.

Description.—Several, or many-headed, branches of the head short or sometimes 5 centimeters (2 inches) long, somewhat knotty and marked with stem scars; roots more than 30 centimeters (12 inches) long, about 1 centimeter (⅖ inch) thick, nearly cylindrical, somewhat branched, light brown, wrinkled, fracture short; bark rather thick, white internally; wood yellowish, spongy; inodorous, sweetish, somewhat bitter, slightly acrid.

Constituents.—Probably a glucoside, resins, euphorbon, starch, etc.

Properties.—Diaphoretic, cathartic, emetic. *Dose*, 0.3, 0.6, 1.3 gram (gr. v, gr. x, ℈j).

EUPHORBIA COROLLATA.—LARGE-FLOWERING SPURGE.

Origin.—Euphórbia corolláta, *Linné.* *Natural order*, Euphorbiaceæ, Euphorbieæ.

Habitat.—United States in meadows; most abundant in the Southern States and west of the Alleghanies.

Description.—Many-headed: branches of the head usually short and stumpy; root 20 centimeters (8 inches) or more long, branched, subcylindrical or elongated-conical, from 5 to 25 millimeters (⅕ to 1 inch) thick, externally blackish-brown or brown-black, wrinkled and somewhat fissured, fracture short, or, in old roots, somewhat fibrous; bark rather thick, white internally; wood yellowish, soft; inodorous, sweetish, somewhat bitter, and slightly acrid.

Constituents.—Resin, mucilage, sugar, starch, etc.; probably similar to preceding.

Properties and Dose.—Diaphoretic (0.3 gm. = gr. v), cathartic (0.6 gm. = gr. x), emetic (1.3 gm. = gr. xx).

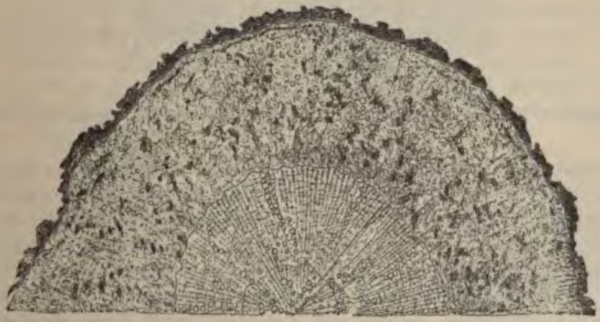
STILLINGIA.—STILLINGIA, QUEEN'S DELIGHT.

Origin.—Stillíngia sylvática, *Linné.* *Natural order*, Euphorbiaceæ, Crotoneæ.

Habitat.—Southern United States, in sandy soil.

Description.—Subcylindrical, about 30 centimeters (12 inches) long, nearly 5 centimeters (2 inches) thick, tapering, little branched, compact, wrinkled, brown-gray, tough, fracture fibrous; internally pinkish, with yellowish-brown dots; odor peculiar, unpleasant; taste bitter, acrid, pungent.

FIG. 32.



Stillingia, magnified 10 diam.

Structure.—Bark thick, covered with a thin cork, and containing many resin cells and few bast fibres; the meditullium porous, and with numerous narrow wedges of wood and medullary rays, the latter containing resin cells. The parenchyme contains starch.

Constituents.—Sylvacrol (acrid resin, soluble in alcohol and chloroform, insoluble in benzin), probably a glucoside, but no alkaloid (E. G. Eberhardt, 1891); resin, fixed oil, volatile oil, tannin, gum, starch; ash, 5 per cent.

Properties. — Alterative, antivenereal, in large doses emetic. *Dose,* 1 to 2 grams (gr. xv–ʒss).

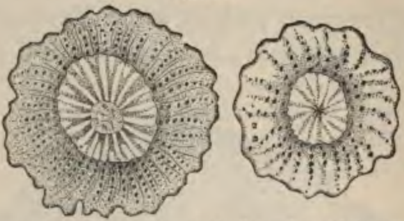
ANGELICA.—Angelica.

Origin.—Archangélica (Angélica, *Moench*) officinális, *Hoffmann.* *Natural order,* Umbelliferæ, Seselineæ.

Habitat.—Central and Northern Europe and Northern Asia; cultivated; collected in the spring of the second year.

Description.—Root-stock 5 to 10 centimeters (2 to 4 inches) long, 2.5 to 5 centimeters (1 to 2 inches) thick, crowned with remnants of leaf-bases, annulate; below divided into numerous nearly simple cylindrical and tuberculate wrinkled branches, which are 2 to 6 millimeters ($\frac{1}{12}$ to $\frac{1}{4}$ inch) thick, and 20 to 30 centimeters (8 to 12 inches) long; grayish-brown; fracture short; aromatic, sweetish, pungent, and bitter. Root-stock with a rather thick bark, irregularly curved yellowish porous wood-wedges, and a whitish pith; root branches with the spongy whitish bark rather thicker than the yellowish soft wood; bark with radiating lines of large resin ducts in the bast rays, which are destitute of bast fibres.

Fig. 33.



Angelica.—Transverse section of root-stock and rootlet, magnified 3 diam.

Constituents.—$\frac{1}{2}$–1 per cent. volatile oil, 6–10 per cent. resin, valerianic acid, $\frac{1}{5}$ per cent. angelic acid, $C_5H_8O_2$ (volatile, crystalline, fusible at 45° C. = 113° F., aromatic), angelicin or hydrocarotin (crystalline, pungent, insoluble in water), sugar, bitter principle, starch, tannin, and 7 or 8 per cent. of ash.

Properties.—Carminative, stimulant, tonic, diaphoretic, in large doses emetic. *Dose*, 0.6 to 2 grams (gr. x–ʒss), in powder or infusion.

ANGELICA ATROPURPUREA.—AMERICAN ANGELICA.

Origin.—Archangélica (Angélica, *Linné*) atropurpúrea, *Hoffmann*, s. Angélica triquináta, *Michaux*. *Natural order*, Umbelliferæ, Seselineæ.

Habitat.—Northern and Western United States, south to Pennsylvania.

Description.—About 10 to 15 centimeters (4 to 6 inches) long and 18 millimeters ($\frac{3}{4}$ inch) thick, branched, deeply wrinkled, light brown-gray, internally whitish, fracture short, with a thick, finely resinous-dotted bark, and soft, radiating wood; aromatic, sweetish, pungent, and bitter.

Constituents.—Volatile oil, volatile acid, resin, starch.

Properties and Dose.—Similar to preceding.

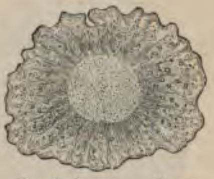
LEVISTICUM.—LOVAGE.

Origin.—Levísticum officinále, *Koch*, s. Ligústicum Levísticum, *Linné*. *Natural order*, Umbelliferæ, Seselineæ.

Habitat.—Southern Europe; cultivated in Germany.

Description.—Head 5 to 10 centimeters (2–4 inches) long and 2 to 4 centimeters ($\frac{4}{5}$–1$\frac{3}{5}$ inches) thick, branched, annulate; below divided into a few nearly simple, subcylindrical, and deeply wrinkled branches, which are about 20 centimeters (8 inches) long and 2 to 6 or 10 millimeters ($\frac{1}{12}$ to $\frac{1}{4}$ or $\frac{2}{5}$ inch) thick; brown or reddish-brown; fracture short, spongy; aromatic, sweetish, pungent, and bitter. Head branches with a rather thick bark, and yellowish porous wood, which is radiate near the bark, and in irregular meshes toward the centre; roots with the bark rather thicker than the porous, yellowish wood; the bark with numerous bast rays, and small resin ducts, in somewhat radiating lines.

FIG. 34.



Levisticum. — Transverse section, magnified 3 diam.

Constituents.—Volatile oil, bitter extractive, resins, sugar, starch, mucilage, angelic acid.

Properties.—Carminative, stimulant, diuretic, emmenagogue. *Dose,* 0.6 to 2 grams (gr. x–ʒss), in infusion.

LASERPITIUM.—White Gentian.

Radix gentianæ albæ.

Origin.—Laserpítium latifólium, *Linné.* *Natural order,* Umbelliferæ, Laserpitieæ.

Habitat.—Central Europe.

Description.—Several-headed, somewhat conical, annulate above, branched below, and deeply wrinkled; the brown, corky layer removed; grayish-white; aromatic, bitter; fracture short, white; bark thick, with numerous orange-colored resin ducts; wood finely porous.

Constituents.—Volatile oil, bitter principle, mucilage, starch.

Properties.—Tonic, stimulant. *Dose,* 1 to 4 grams (gr. xv–ʒj).

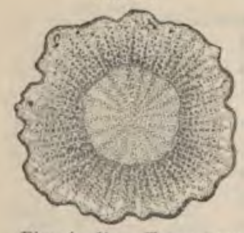
PIMPINELLA.—Pimpernel.

Origin.—Pimpinélla Saxífraga, *Linné,* and P. mágna, *Linné.* *Natural order,* Umbelliferæ, Ammineæ.

Habitat.—Central Europe and Western Asia, in dry and mountainous localities.

Description.—Several-headed, branches of the head short, terminated by the hollow stem-base; fusiform, about 20 centimeters (8 inches) long, annulate above, longitudinally wrinkled and tuberculate below; externally yellowish-brown or brown-yellow; aromatic, sweetish, pungent; fracture short, whitish; bark thick, radiate, with numerous yellow resin ducts in radiating lines; wood yellowish, porous, radiate, with broad medullary rays. The pith of the head contains resin cells.

Fig. 35.



Pimpinella.—Transverse section, magnified 3 diam.

Constituents.—Volatile oil, acrid resin, sugar, starch, crystallizable and almost tasteless pimpinellin.

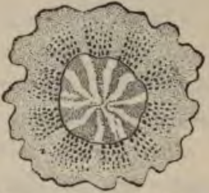
Properties.—Stimulant, tonic, sialagogue. *Dose,* 0.5 to 2 grams (gr. viij–ʒss).

PETROSELINUM.—PARSLEY.

Origin.—Petroselínum satívum, *Hoffmann*, s. Apium (Cárum, *Baillon*) Petroselínum, *Linné*. *Natural order*, Umbelliferæ, Ammineæ.

Habitat.—Southern Europe; extensively cultivated.

FIG. 36.



Petroselinum. — Transverse section, magnified 3 diam.

Description. — Somewhat conical, about 15 centimeters (6 inches) long, and about 12 millimeters (½ inch) thick; light brown-yellow; annulate above, wrinkled below, with transverse ridges; faintly aromatic, sweetish; fracture short; bark thick, resinous-dotted, and, like the medullary rays, white; wood light yellow, porous.

Constituents.—Volatile oil, mucilage, sugar, starch, apiin (tasteless).

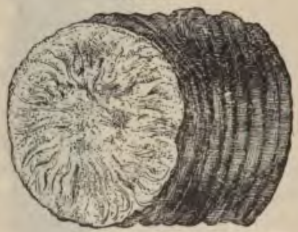
Properties. — Carminative, diuretic, nephritic, discutient. *Dose*, 2 to 4 grams (ʒss–j), in infusion.

SUMBUL.—SUMBUL.

Origin.—Férula (Euryángium, *Kauffmann*) Súmbul, *Hooker-filius*. *Natural order*, Umbelliferæ, Peucedaneæ.

Habitat.—Central and Northeastern Asia.

FIG. 37



Sumbul.—Section.

Description. — In transverse segments about 5 centimeters (2 inches) thick, and 2.5 centimeters (1 inch) long, but varying considerably in diameter and thickness, light, spongy, annulate or longitudinally wrinkled; fracture irregularly fibrous; gray-brown, internally whitish and brown-yellow; odor strong, musk-like; taste bitter and balsamic.

Structure.—Bark thin, with fibre circles; wood fibres irregularly twisted; resin ducts numerous in the spongy white parenchyme.

False Sumbul of India.—Ammoniacum root, somewhat flavored with sumbul; firmer, denser, and of a yellow or reddish tint.

Constituents.—Volatile oil, $\frac{1}{3}$ per cent., bluish; soft resin, 9 per cent., of musk odor; angelic acid, methylcrotonic acid, valerianic acid, bitter extractive, sugar, starch; on dry distillation yields umbelliferon.

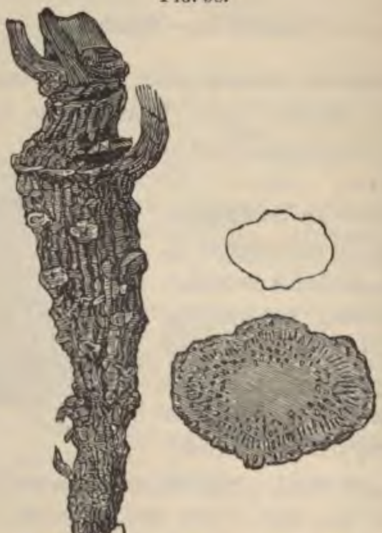
Properties.—Stimulant, tonic, nervine. *Dose,* 0.5 to 2 grams (gr. viij–ʒss) in powder, tincture, or fluid extract.

IMPERATORIA.—Masterwort.

Origin.—Peucédanum (Imperatória, *Linné*) Ostrúthium, *Baillon.* *Natural order,* Umbelliferæ, Peucedaneæ.

Habitat.—Southern and Central Europe.

Fig. 38.



Imperatoria root, natural size; and transverse section, magnified.

Description.—Somewhat conical, about 5 centimeters (2 inches) long, and nearly 2 centimeters ($\frac{4}{5}$ inch) thick, flattish, finely annulate above, wrinkled and tuberculate; brown-gray, internally whitish, with numerous resin dots; odor balsamic; taste pungent and bitter; bark thin, wood-bundles small, inclosing a large pith.

Constituents.—Volatile oil $\frac{3}{4}$ per cent., imperatorin (peucedanin; crystalline, pungently acrid, insoluble in water), ostruthin (tasteless).

Properties.—Stimulant, tonic. *Dose,* 1 to 2 grams (gr. xv–xxx).

PANAX.—GINSENG.

Origin.—Pánax (Arália, *Gray*) quinquefólium, *Linné.* *Natural order*, Araliaceæ, Panaceæ.

Habitat.—North America, south to the mountains of Georgia and Tennessee; in rich woods.

Description.—Fusiform, 50 to 75 millimeters (2 to 3 inches) long, annulate above, divided below into 2 or 3 equal branches, wrinkled longitudinally; sweetish and slightly aromatic; externally pale brownish-yellow; fracture short, mealy, white, with a thin bark containing numerous reddish resin cells; wood-wedges narrow, yellowish; medullary rays broad.

Constituents.—Panaquilon, sweet, amorphous, soluble in water and alcohol, insoluble in sodium sulphate solution, precipitated by tannin; resin, mucilage, starch.

Properties.—Demulcent, slightly stimulant. *Dose,* 1 to 8 grams (gr. xv–ʒij).

IPOMŒA PANDURATA.—WILD JALAP, MANROOT.

Origin.—Ipomœ'a (Ipomæ'a) panduráta, *Meyer.* *Natural order*, Convolvulaceæ, Convolvuleæ.

Habitat.—United States, in sandy fields.

Description.—Large, conical, about 5 centimeters (2 inches) thick, above with several rhizome branches about 1 centimeter ($\frac{2}{5}$ inch) thick; in longitudinal or transverse slices, with overlapping bark, wrinkled and brownish-gray externally, whitish internally; bark thin with a zone of resin cells; wood-wedges numerous and narrow, in the medullary rays scattered resin cells; odor slight; taste sweetish, bitter, somewhat acrid.

Constituents.—Resin 1–2 per cent., sugar, gum, coloring matter, starch. The resin is a glucoside, soluble in alcohol, ether, chloroform, and alkalies, the latter solution being precipitated by acids.

Properties.—Diuretic, cathartic. *Dose,* 1 to 4 grams (gr. xv–ʒj).

ARMORACIA.—Horseradish.

Origin.—Cochleária Armorácia, *Linné,* s. Armorácia rusticána, *Gaertner. Natural order,* Cruciferæ, Alyssineæ.

Habitat.—Eastern Europe, cultivated.

Description.—Used only in the fresh state. Heads several, annulate; root cylindrical, 30 centimeters (12 inches) or more long, 12 to 25 millimeters (½–1 inch) thick, pale yellowish-brown, somewhat scaly and warty; internally white, fracture short; when crushed, of a pungent odor and sharp, acrid taste.

Structure.—Bark thickish, covered with a thin cork and containing numerous yellow stone cells in the outer layer; wood-bundles small in narrow wedges; medullary rays broad; the rhizome with a central pith.

Constituents.—Volatile oil 0.05 per cent., of same composition as oil of mustard, resin, sugar, starch, etc., and about 80 per cent. of water.

Properties.—Stimulant, irritating, rubefacient.

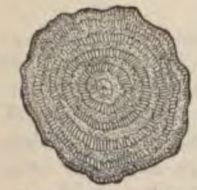
Substitution.—In Europe fresh aconite root, which has a radish-like odor, has been mistaken for horseradish.

PHYTOLACCÆ RADIX.—Pokeroot.

Origin.—Phytolácca decándra, *Linné. Natural order,* Phytolaccaceæ, Euphytolacceæ.

Habitat.—North America, in waste places; naturalized in Southern Europe and the West Indies.

Fig. 39.



Phytolacca.—Transverse section, natural size.

Description.—Large, conical, somewhat branched, mostly in transverse or longitudinal slices, wrinkled, brown-gray; internally whitish, hard; fracture fibrous; inodorous; sweetish, acrid.

Structure.—Bark thin, with a thin suberous coat; wood-bundles numerous, small, and narrow, arranged in rays and concentric circles, and surrounded by thin-walled parenchyme.

Constituents.—Resin, probably a glucoside, starch, tannin, mucilage, volatile acid, waxy matter, sugar, ash 8–10 per cent.

Properties. — Alterative, anodyne, resolvent, emetic. *Dose,* 0.3 to 2 grams (gr. v–ʒss) in powder, decoction, or extract.

BRYONIA.—BRYONY.

Origin.—Bryónia alba and B. dioíca, *Linné.* *Natural order,* Cucurbitaceæ, Cucumerineæ.

Habitat.—Central and Southern Europe.

Description—Root conical, about 50 centimeters (20 inches) long, and 5 to 10 centimeters (2 to 4 inches) thick; in commerce usually in thin, rugged disks; externally wrinkled, brownish, from the first species with warts and transverse ridges; fracture short; internally white or grayish; inodorous; disagreeably bitter.

Structure.—Bark thin with a thin friable cork; wood-bundles numerous, small, arranged in rays and concentric circles, and surrounded by thin-walled parenchyme.

Constituents.—Bryonin (bitter glucoside, soluble in water and alcohol, insoluble in ether, precipitated by tannin; yields bryoretin and hydrobryoretin, besides sugar), starch, sugar, gum, etc.

Properties.—Emmenagogue, hydragogue cathartic. *Dose,* 0.6 to 4 grams (gr. x–ʒj).

BELLADONNÆ RADIX.—BELLADONNA ROOT.

Origin.—Átropa Belladónna, *Linné.* *Natural order,* Solanaceæ, Atropeæ.

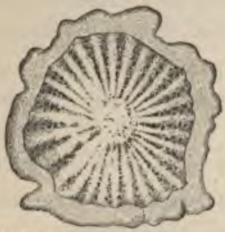
Habitat.—Central and Southern Europe, in woods.

Description.—In cylindrical, somewhat tapering, longitudinally wrinkled pieces, 20 to 30 centimeters (8 to 12 inches) long and 12 to 25 millimeters (½ to 1 inch) or more thick; externally brownish-gray, internally whitish; fracture nearly smooth, mealy, not radiating in the bark or in the meditullium, except in the thicker roots inside and near the cambium line; nearly inodorous; taste sweetish, afterward bitterish and strongly acrid.

Roots which are tough, woody, and break with a splintery fracture, also the hollow stem bases sometimes present, should be rejected.

Structure.—Bark thickish, indistinctly radiate, free from bast fibres; wood-bundles yellowish, near the centre small and distant, surrounded in the thicker roots by broader wood-wedges and equally wide medullary rays. The wood predominates in old roots.

FIG. 40.



Belladonna.—Transverse section, magnified 3 diam.

Constituents.—Atropine 0.2–0.6 per cent., belladonine (probably oxyatropine, $C_{17}H_{23}NO_4$), hyoscyamine, atropamine, starch, atrosin (a fluorescent compound). Atropine, $C_{17}H_{23}NO_3$, is white, crystalline, bitter and acrid, soluble in ether, chloroform, alcohol, also in water; with alkalies yields tropic acid and tropine; its gold precipitate is crystallizable and of a dull yellow color. On digesting tropine tropate in acidulated water, atropine is reproduced. Other alkaloids (tropeines) are formed in a similar manner; tropine mandelate thus yields homatropine, $C_{16}H_{21}NO_3$, which resembles atropine in its effects. Atropamine, $C_{17}H_{21}NO_2$, which is sometimes present, is easily decomposed by mineral acids.

Young roots contain only hyoscyamine; older roots (8–10 years) also atropine; the alkaloids are found chiefly in the bark; hence woody roots should be rejected; it is present in largest quantity about the time of flowering.

Properties.—Diuretic, dilating the pupil, sedative, narcotic. *Dose*, 0.06 gram (gr. j); of atropine, 0.5 to 1 milligram ($\frac{1}{125}$–$\frac{1}{64}$ grain).

Antidotes.—Emetic (vegetable or mineral), or stomach-pump; stimulants (brandy, coffee, etc.); morphine; physostigmine; pilocarpine.

Allied Drug.—The rhizome of Scópola (Scopólia) carniólica, *Jacquin*, indigenous to southern Central Europe, is of horizontal growth, 2–4 centimeters (1–1$\frac{1}{2}$ inch) thick, almost jointed with few annulations; tissues similar as in belladonna root; contains the same alkaloids.

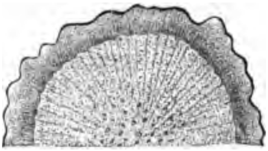
ALTHÆA.—MARSHMALLOW.

Origin. — Álthæa officinális, *Linné*. *Natural order*, Malvaceæ, Malveæ.

Habitat.—Europe, Western and Northern Asia; naturalized in the eastern United States and in Australia, in salt marshes; cultivated in Europe.

Description. — The fleshy branches are collected and deprived of the brown corky layer; cylindrical or conical, longitudinally wrinkled pieces, from 7 to 15 centimeters (3 to 6 inches) long, and about 1 centimeter ($\frac{2}{5}$ inch) or more in diameter; externally white, mealy, somewhat hairy from detached slender bast fibres, and marked with circular scars of the rootlets; fracture short and granular in the meditullium, whitish and fleshy or mealy. Odor faint, peculiar, stronger in infusion; taste sweetish, mucilaginous.

FIG. 41.



Althæa.—Transverse section, magnified 2 diam.

Marshmallow should not be coated with lime.

Young uncoated belladonna root resembles marshmallow; but is externally not fibrous, and has yellowish wood-bundles or wood-wedges.

Structure.—Bark thickish; inner bark radiating from small groups of long bast fibres; meditullium in outer layer faintly radiating; wood-bundles distant and small; medullary rays narrow; the parenchyme filled with starch and containing scattered crystal cells and larger mucilage cells.

Constituents.—Asparagin, about 1 per cent.; mucilage, 35 per cent.; sugar, 8 per cent.; pectin, 10 per cent.; starch, 35 per cent.; ash, 4–5 per cent.

Properties.—Demulcent. *Dose*, 2 to 8 grams (ʒss–ij) in infusion or syrup.

RUBIA.—MADDER.

Origin.—Rúbia tinctórum, *Linné.* *Natural order*, Rubiaceæ, Galieæ.

Habitat.—Levant and Southern Europe.

Description.—Rhizome cylindrical, long, about 5 millimeters ($\frac{1}{5}$ inch) thick with distant nodes; roots about 3 millimeters ($\frac{1}{8}$ inch) thick, dark red, deeply wrinkled, with a foliaceous cork, thin brown-red inner bark, spongy red wood, and irregular medullary rays, the rhizome with a dark-red small pith; fracture short, odor feeble; taste sweetish and slightly bitter, acrid, and astringent. Mostly kept in form of powder.

Constituents.—Rubian (yellow, bitter), rubihydran (gum-like), ruberythrin (yellow needles, blood-red with alkalies), alizarin (orange-red needles, purple or blue with alkalies), purpurin (red needles, violet colored with alkalies), pectin, sugar, tannin, etc.

Properties.—Tonic, emmenagogue. *Dose*, 1 to 4 grams (gr. xv–ʒj).

ALKANNA.—ALKANET.

Origin.—Alkánna (Anchúsa, *Linné*) tinctória, *Tausch* *Natural order*, Boragineæ, Borageæ.

Habitat.—Western Asia and Southeastern Europe.

Description.—Fusiform, about 10 centimeters (4 inches) long, and 1 to 2 centimeters (⅖–⅘ inch thick), with a crown of felt-like leaf bases; deeply wrinkled; bark dark purple, foliaceous, friable, easily separated from the twisted yellowish wood, which is cleft by purple friable medullary rays; nearly inodorous and tasteless; does not tinge the water red.

Constituents.—Alkannin, little starch. Alkannin is of resinous appearance, dark purplish-red, soluble in ether, alcohol, fats, and certain volatile oils, with a red color; in alkalies blue.

Uses—For coloring tinctures and pomades.

HEUCHERA.—Alum Root.

Origin.—Heúchera americána, *Linné*. *Natural order*, Saxifragaceæ, Saxifrageæ.

Habitat.—United States, woodlands.

Description.—About 15 centimeters (6 inches) long, and 12 millimeters (½ inch) thick, several-headed, somewhat contorted, branched, wrinkled, tuberculate, purplish-brown, fracture short and granular; internally reddish or brownish; bark thin or thickish; meditullium rather spongy; inodorous; very astringent, somewhat bitter.

Constituents.—About 14 per cent. of tannin (by ferric chloride dark green from acid solution, and dark blue from neutral solution), trace of gallic acid, sugars, etc.

Properties.—Astringent. *Dose*, 1 to 2 grams (gr. xv–xxx).

CALUMBA.—Colombo.

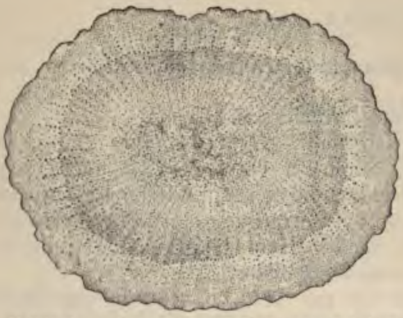
Origin.—Jateorrhíza Calúmba, *Miers*. *Natural order*, Menispermaceæ, Tinosporeæ.

Habitat.—Eastern Africa, cultivated in some East Indian islands.

Description.—Nearly circular or broadly elliptic disks, 3 to 6 centimeters (1⅕ to 2⅖ inches) in diameter, 6 to 12 millimeters (¼ to ½ inch) thick, externally greenish brown-gray and wrinkled; internally yellowish, and near the cambium gray; depressed in the centre, with a few interrupted circles of projecting wood-bundles, distinctly radiate in the outer portion near the blackish cambium line; fracture short, mealy; odor slight; taste mucilaginous, slightly aromatic, very bitter.

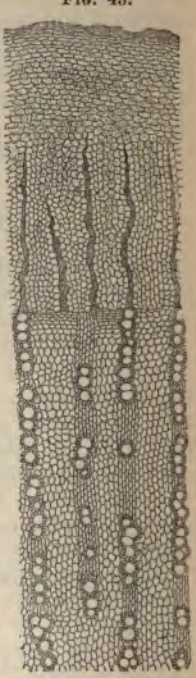
Structure.—Bark thickish, with a thin brown cork and narrow bast rays without fibres; wood-bundles bright yellow, small, distant near the centre, in narrow rays near the bark: medullary rays broader; the parenchyme filled with starch.

FIG. 42.



Calumba.—Transverse section, natural size.

FIG. 43.



Magnified 25 diam.

Constituents.—Columbin about 0.8 per cent. (white, crystalline, slightly soluble in water), berberine (yellow, crystalline), columbic acid (yellowish, amorphous, nearly insoluble in cold water), starch, mucilage, ash about 6 per cent.

Properties.—Tonic. *Dose*, 0.5 to 2 or 4 grams (gr. viij–ʒss–j), in infusion, tincture, extract.

RUMEX.—YELLOW DOCK.

Radix lapathi.

Origin.—Rúmex críspus, *Linné*, and other species of Rumex. *Natural order*, Polygonaceæ, Rumiceæ.

Habitat.—Europe, naturalized in North America; in grassy places and along roadsides.

Description.—Fusiform, 10 to 20 centimeters (4 to 8 inches) long, 1 to 2 centimeters ($\frac{2}{5}$ to $\frac{4}{5}$ inch) thick, annulate above, deeply longitudinally wrinkled below; externally brown or reddish-brown, internally dingy brownish-yellow; fracture short; nearly inodorous, taste bitter and astringent; on mastication the saliva is tinged yellowish.

Structure.—Bark thickish, with a thin cork and distinct yellowish bast wedges; cambium circle prominent; wood wedges porous, somewhat horny; medullary rays narrow. The parenchyme contains starch grains, reddish-brown coloring matter, and crystals of calcium oxalate.

Constituents.—Tannin, mucilage, starch, chrysophanic acid (rumicin, lapathin), calcium oxalate.

Properties.—Astringent, tonic, alterative, in larger doses laxative. *Dose*, 1 to 4 grams (gr. xv–ʒj).

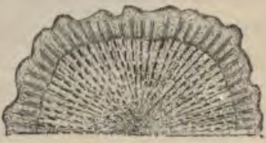
RHAPONTICUM.—RHAPONTIC ROOT. CRIMEAN RHUBARB.

Origin.—Rhéum rhapónticum, *Linné*. *Natural order*, Polygonaceæ, Rumiceæ.

Habitat. — Western Asia, cultivated in some parts of Europe, and in North America (pie plant).

Description.—Fusiform, about 10 centimeters (4 inches) long, and 2 centimeters ($\frac{4}{5}$ inch) thick, somewhat annulate above, deeply wrinkled; partly deprived of the orange-red cork; fracture short, internally whitish, with narrow straight interrupted red medullary rays, and a rather thick bark; odor and

FIG. 44.



Rhaponticum.—Transverse section, magnified 3 diam.

taste resembling rhubarb, more mucilaginous, and less gritty; the saliva, on mastication, tinged yellow.

Constituents.—Like rhubarb, but astringency predominating.

Properties.—Astringent, laxative. *Dose*, 1 to 3 grams (gr. xv–xlv).

RHEUM.—RHUBARB.

Origin.—Rhéum officinále, *Baillon*, and probably other species of Rheum. *Natural order*, Polygonaceæ, Rumiceæ.

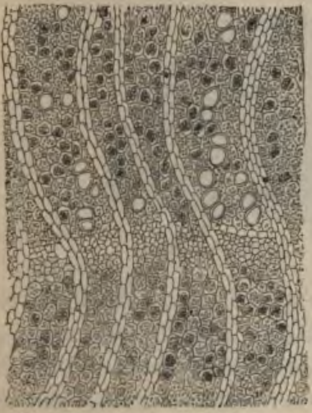
Habitat.—Western and Central China.

Description.—Cylindrical, conical, or flattish segments of the rhizome or its lateral branches, deprived of most of the dark-brown corky layer, smoothish or somewhat wrinkled, externally marked with white, elongated meshes, containing a white, rather spongy tissue, and a number of short red-brown or brown-yellow striæ; compact, hard; fracture uneven; internally white, marbled with yellow and red; odor peculiar, aromatic; taste bitter, somewhat astringent; gritty when masticated; the saliva is tinged orange-yellow.

Structure.—The predominating tissue is thin-walled parenchyme containing starch or crystal groups of calcium oxalate. The narrow medullary rays contain orange-red coloring matter, are parallel only near the cambium, and in the interior are irregularly curved and interrupted. The vascular bundles are soft and porous. Near the cambium line are a few stellate spots, or sometimes a larger number arranged in a loose circle; they indicate the internal origin of the leaves, and contain short, red, somewhat wavy medullary rays radiating from a common centre.

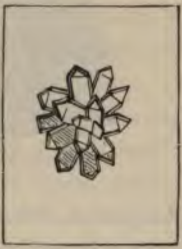
Varieties.—1. *Russian Rhubarb* came from Chinese Tartary by way of Siberia (Kiachta) to St. Petersburg, and consisted of carefully selected pieces, which after drying were trimmed to beneath the cambium line, and marked with a conical hole, penetrating beyond the middle. It is no longer an article of commerce.

FIG. 45.



Rhubarb.—Section near the cambium, magnified 40 diam.

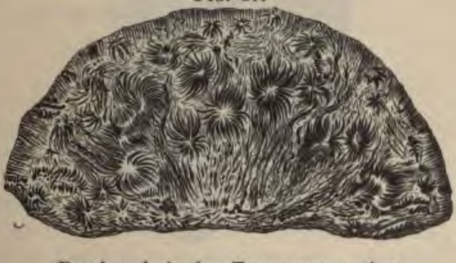
FIG. 46.



Oxalate of calcium crystals in rhubarb.

2. *Chinese Rhubarb*, sometimes called *East India Rhubarb*, is exported from Canton and other Chinese ports, occasionally by way of India. The inner bark is always present, small patches of the rough corky layer are occasionally adhering, and fragments of twine on which the root was dried are not unfrequently observed. Its color is

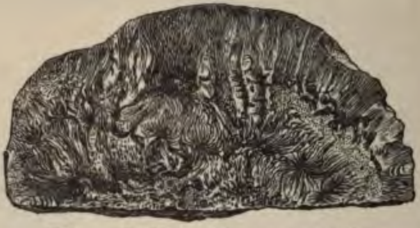
FIG. 47.



Russian rhubarb.—Transverse section.

less bright, and its odor somewhat less aromatic than that of Russian rhubarb. This variety is the officinal rhubarb.

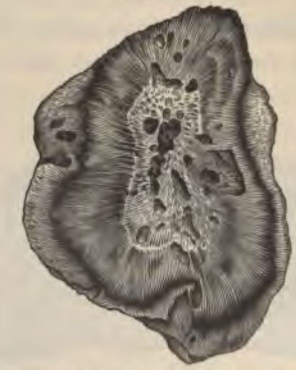
FIG. 48.



Chinese rhubarb.—Transverse section.

3. *European Rhubarb.* From Rhéum palmátum, rhapónticum, compáctum, undulátum, Emódi, and other species, cultivated in Moravia (Austria), England, and France. Frequently trimmed so as to resemble Chinese rhubarb, but the surface entirely or nearly destitute of white meshes, and the medullary rays interrupted, narrow, and nearly straight; the color is paler, the odor weaker, the taste more mucilaginous, and on mastication it is less gritty

FIG. 49.



European rhubarb.—Transverse section.

than Chinese rhubarb. It is sometimes used in veterinary practice.

Constituents.—Chrysophan, chrysophanic acid, erythroretin, emodin, phæoretin, aporetin, starch, tannin, crystals of calcium oxalate; the first-named principles yield with alkalies a deep-red or brown-red color. *Chrysophan*, $C_{27}H_{30}O_{14}$, is orange-yellow, bitter, soluble in alcohol and water, yields with dilute acids sugar and *chrysophanic acid*, $C_{15}H_{10}O_4$; this is nearly tasteless, bright yellow, crystalline, freely soluble in benzol, chloroform, volatile and fixed oils, less soluble in alcohol and ether, nearly insoluble in cold water. *Erythroretin* is yellow, tasteless, readily soluble in alcohol, less so in ether. *Emodin* is orange-colored, nearly insoluble in benzol. *Phæoretin* is yellowish-brown, soluble in alcohol, insoluble in ether, chloroform, and water. *Aporetin* is blackish, resinous, sparingly soluble in simple solvents. *Rheotannic acid*, $C_{26}H_{26}O_{14}$, is yellowish, soluble in water and alcohol, and yields with dilute acids sugar and *rheumic acid*, $C_{20}H_{16}O_9$, which is red, amorphous and sparingly soluble in cold water.

Properties.—Tonic, astringent, aperient, purgative. *Dose*, 0.3 to 1.6 grams (gr. v–xxv).

METHYSTICUM.—KAVA-KAVA.

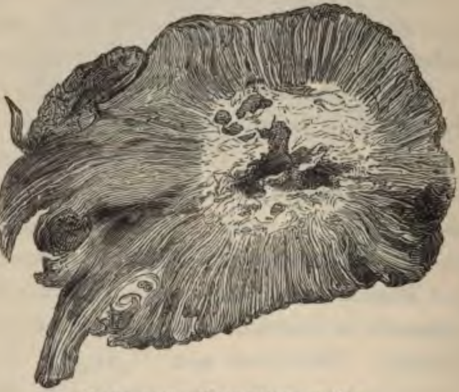
Origin.—Píper (Macropíper, *Miquel*) methy′sticum, *Forster*. *Natural order*, Piperaceæ, Pipereæ.

Habitat.—South Sea Islands.

Description.—Root large, in commerce usually cut longitudinally and transversely into irregular pieces; light, and often more or less hollow in the interior; externally blackish-gray, internally dingy white; fracture farinaceous and somewhat splintery; bark thin; meditullium porous, with irregularly twisted thin wood-bundles, radiating near the surface and separated by broader white medullary rays, the wood-bundles forming distinct meshes underneath the bark. Rootlets, if present, about 30 centimeters (12 inches) or more in length, often braided, more or less fibrous. Odor slight, agreeably aromatic; taste somewhat pungent and benumbing.

Constituents.—Acrid resin 2 per cent., little volatile oil, kavahin (crystalline, tasteless, soluble in water, not colored by nitric acid, yields benzoic acid); methysticin, $C_{16}H_{18}O_5$ (crystalline, tasteless, insoluble in water, colors nitric acid yellow and red); gum, starch 45 per cent., ash 4 per cent.

FIG. 50.



Kava root.—Transverse section.

Properties.—Stimulant, diuretic, diaphoretic, and tonic. *Dose*, 1 to 4 grams (gr. xv–lx). The alcoholic extract is a local anæsthetic.

HYDRANGEA.—Hydrangea.

Origin.—Hydrángea arboréscens, *Linné.* *Natural order*, Saxifrageæ, Hydrangeæ.

Habitat.—United States; on rocky banks.

Description.—Head irregular, knotty, about an inch or more in thickness; roots thinner, much bent and branched, usually cut into pieces of variable length; the bark about $\frac{1}{20}$ inch thick, pale-gray with rust-colored patches, slightly ridged longitudinally or somewhat scaly, brittle, and readily separated from the tough, white, tasteless wood, the latter with numerous narrow or linear wood-wedges and medullary rays;

fracture splintery; inodorous; taste of the bark sweetish, somewhat pungent.

Constituents.—Resin, gum, sugar, starch, crystalline glucoside (Bondurant, 1887).

Properties.—Diuretic, lithontryptic. *Dose,* 2 to 4 grams (ʒss–j).

GLYCYRRHIZA.—LICORICE ROOT.

Radix liquiritiæ.

Origin.—Glycyrrhíza glábra, *Linné.* *Natural order,* Leguminosæ, Papilionaceæ, Galegeæ.

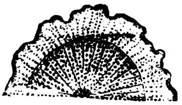
Habitat.—Southern Europe and Western Asia, cultivated.

Description.—Long cylindrical pieces, from 5 to 25 millimeters ($\frac{1}{5}$ to 1 inch) thick, longitudinally wrinkled, externally grayish-brown, warty; internally tawny-yellow; pliable, tough; fracture coarsely fibrous; nearly inodorous; taste sweet, somewhat acrid.

The underground runners, which are often present, have the same appearance, but contain a thin pith.

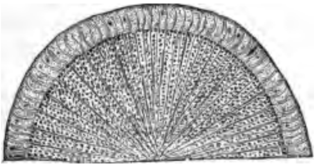
Structure.—Bark rather thick, with a thin cork and narrow bast wedges, the latter containing tough bast-fibres and cells with crystals of calcium oxalate. Wood-wedges narrow, appearing porous from small groups of large ducts, and accompanied by crystal cells. Medullary rays distinct, consisting of several rows of cells, and containing starch.

FIG. 51.



Glycyrrhiza glabra (rhizome).

FIG. 52



Glycyrrhiza glandulifera (root).

Varieties.—1. *Spanish, Italian, and Turkish licorice root.* The kind described, exported from the countries named.

2. *Russian licorice root.* From Glycyrrhíza glandulífera, *Waldstein et Kitaibel* (a variety of Gl. glabra indigenous to Southeastern Europe). It is mostly thicker than the preceding, contains few runners, is deprived of the corky layer, externally bright tawny-yellow, smooth, the wood-wedges softer and paler, the cells larger, and the tissue often cleft.

Constituents.—Glycyrrhizin about 6 per cent. (combined with ammonia), glycyramarin, sugar, asparagin about 3 per cent., starch, resin. Glycyrrhizin, $C_{24}H_{36}O_9$ or $C_{44}H_{63}NO_{18}$ (?), is sparingly soluble in alcohol and ether, soluble in hot water; its neutral ammonium salt freely soluble in water, insoluble in absolute alcohol. It is a glucoside, splitting into glucose (or parasaccharic acid ?) and bitter glycyrretin.

Properties.—Demulcent, expectorant. *Dose,* 1 to 4 grams (gr. xv–ʒj).

HEMIDESMUS.—Indian Sarsaparilla.

Origin.—Hemidésmus índicus, *R. Brown.* *Natural order,* Asclepiadeæ, Periploceæ.

Habitat.—East Indies.

Description.—Cylindrical pieces, about 15 centimeters (6 inches) long, and 6 to 12 millimeters (¼–½ inch) thick, tortuous, wrinkled, and fissured, dark-brown, hard; internally whitish and mealy; odor tonka-like; taste sweetish and slightly acrid. The stems are nearly inodorous and tasteless.

Structure.—Bark thin, with a thin cork and small scattered laticiferous ducts. Medullary rays narrow, indistinct.

Constituents.—Stearopten, starch, etc.

Properties.—Diaphoretic, diuretic, alterative, tonic. *Dose,* 2 to 4 grams (ʒss–j).

ABRI RADIX.—Indian Licorice.

Origin.—Ábrus precatórius, *Linné.* *Natural order,* Leguminosæ, Papilionaceæ, Vicieæ.

Habitat.—India; naturalized in most tropical countries.

Description.—Cylindrical, somewhat twisted pieces, 6 to 25 millimeters (¼–1 inch) thick; externally light reddish-brown;

fracture short, fibrous; internally yellowish; bark quite thin; meditullium composed of alternating layers of porous wood and parenchyme, traversed by medullary rays varying in width; odor slight; taste bitterish, afterward sweetish.

***Constituents.*—Glycyrrhizin (?), sugar, etc.**

***Properties.*—Demulcent, emollient.**

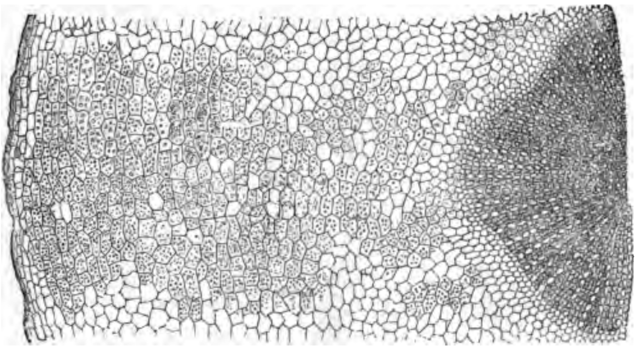
IPECACUANHA.—IPECACUANHA.

Origin.—Cephaëlis Ipecacuánha, *A. Richard.* *Natural order*, Rubiaceæ, Psychotrieæ.

Habitat.—Brazil to Bolivia and New Granada, in damp forests; cultivated in India.

Description.—About 10 centimeters (4 inches) long and 4 millimeters ($\frac{1}{6}$ inch) thick; mostly simple, contorted, dull gray-brown or blackish, finely wrinkled, closely irregularly annulated, and often transversely fissured; internally scarcely radiate; bark brittle, brownish, somewhat waxy, easily separated from the thin, whitish, tough, and nearly tasteless ligneous portion which amounts to about 15 per cent. of the root; odor slight, nauseous; taste bitterish, acrid, nauseating.

FIG. 53.

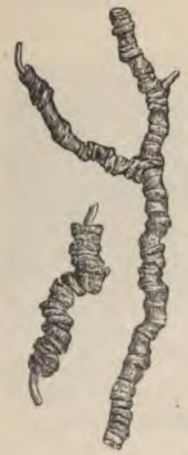


Ipecacuanha —Transverse section, magnified 65 diam.

Structure.—Cork thin. Bark not uniform in thickness, not radiating, consists of parenchyme inclosing starch or raphides of calcium oxalate, the latter being more numerous in the inner bark. Meditullium slightly radiating, consists mainly of pitted wood cells containing starch.

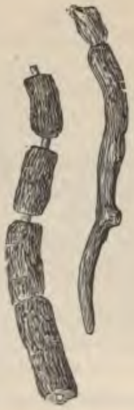
Varieties.—According to the tint of the corky layer, *gray*, *red*, and *black* ipecac, all being derived from the same species. Ipecacuanha from Carthagena is somewhat larger than the Brazilian root, less conspicuously annulate, has a more firmly adhering bark, and the medullary rays of the wood are more distinct; it comes from Cephaélis acumináta, *Karsten*.

Fig. 54.



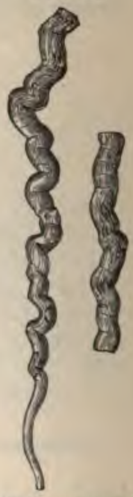
Ipecacuanha.

Fig. 55.



Striated ipecacuanha.

Fig. 56.



Undulated ipecacuanha.

Substitution.—The following are used in Brazil, besides other roots, like ipecacuanha, and are occasionally met with in Europe, but rarely seen in the United States:

Striated ipecacuanha. From Psychótria emética, *Linné*.

Natural order, Rubiaceæ, Psychotrieæ. Longitudinally wrinkled, not annulate, but with distant transverse fissures; dark purplish-brown; bark thick, containing much sugar, no starch, and little emetine.

Undulated ipecacuanha. From Richardsónia scábra, *Saint Hilaire.* *Natural order*, Rubiaceæ, Spermacoceæ. Undulate, slightly wrinkled, somewhat annulate and transversely fissured; externally brownish-gray; bark white, mealy, not bitter; wood nearly the thickness of the bark.

White ipecacuanha. From Ionídium Ipecacuánha, *Ventenat.* *Natural order*, Violarieæ, Violeæ. Somewhat branched, not annulate, longitudinally wrinkled, whitish or pale brownish-yellow; wood porous, rather thick, yellowish; free from starch.

Constituents.—Emetine from 1 to 2 per cent., choline (bilineurine), ipecacuanhic acid (amorphous bitter glucoside), resin, pectin, starch, saccharose. Emetine, $C_{30}H_{40}N_2O_5$, is a white powder, soluble in alcohol, ether, and chloroform, slightly soluble in cold water, benzol, benzin, and fixed oils; fusible at 65° C., afterward at 74° C.; colored bright yellow or orange by solution of chlorinated lime; its chromate and nitrate are nearly insoluble.

Properties.—Expectorant, nauseant, emetic. *Dose*, 0.06, 0.3, to 1 or 2 grams (gr. j, gr. v, gr. xv–xxx).

APOCYNUM ANDROSÆMIFOLIUM.—Dog's Bane.

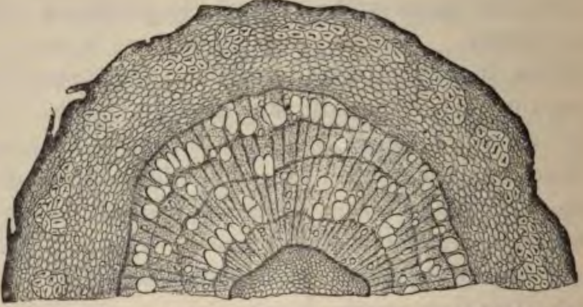
Origin.—Apócynum androsæmifólium, *Linné.* *Natural order*, Apocynaceæ, Echitideæ.

Habitat.—North America, chiefly northward.

Description.—Long, cylindrical, branched, about 8 millimeters ($\frac{1}{3}$ inch) or less thick; bark pale brownish, wrinkled, transversely fissured, thickish; internally white, containing a circle of stone-cell groups, and rather small laticiferous ducts; unpleasantly bitter, easily separable from the tough, white, porous, and tasteless wood, which has narrow medullary rays. The rhizome has a central pith.

It should not be confounded with the root of Apócynum cannábinum, *Linné*, which has a relatively thicker bark and soft fragile, porous wood.

Fig. 57.



Apocynum androsæmifolium.—Transverse section, magnified 25 diam.

Constituents.—Bitter principle (probably apocynin and apocynein), resin, caoutchouc, starch, etc.

Properties.—Diuretic, sudorific, emetic, cathartic. *Dose*, 0.3 to 1.6 grams (gr. v–xxv).

GELSEMIUM.—Gelsemium. Yellow Jasmine.

Origin. — Gelsémium sempervírens, *Aiton.* *Natural order*, Loganiaceæ, Gelsemieæ.

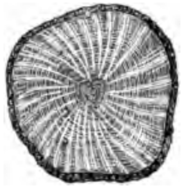
Habitat.—Southern United States.

Description.—The creeping rhizome and rootlets are collected. Cylindrical, long or cut in sections, occasionally 3 centimeters (1¼ inch) thick, the roots often thinner; externally light brown-yellow with purplish-brown longitudinal lines; tough, fracture splintery; internally yellowish; odor aromatic, heavy; taste bitter, of the wood slightly so.

Structure.—Bark thin, with a thin cork and silky bast fibres, adheres closely to the wood. The latter is yellowish, composed of porous wood-wedges, and has rather broad medullary rays. The rhizome has a thin pith. The parenchyme contains starch and a few crystals of calcium oxalate.

Constituents.—Volatile oil, gelsemine, gelseminine, gelseminic acid (regarded by some as being identical with æsculin), resin, starch. Gelsemine, $C_{54}H_{69}N_4O_{12}$ (F. A. Thompson, 1887), is colorless, bitter, crystallizes with difficulty, dissolves in 650 parts cold water, is freely soluble in ether, chloroform, and alcohol, and yields with HCl and HNO_3 crystalline anhydrous salts, soluble in 40 parts water; it is not colored by strong H_2SO_4 or HNO_3, but with sulphuric acid and manganic oxide becomes cherry-red, then olive-green. Gelseminine is brown, amorphous, bitter, the salts amorphous, the chloride freely soluble; H_2SO_4 colors light yellow, HNO_3 deep green; sulphuric acid and manganic oxide color deep purple, changing to purplish-blue.

FIG. 58.



Gelsemium.—Transverse section.

Antidotes.—Evacuants (stomach-pump, emetic); atropine; stimulants.

Properties.—Nervine, antispasmodic, sedative. *Dose,* 0.2 to 0.6 gram (gr. iij–x) in powder, tincture, or fluid extract.

PAREIRA.—PAREIRA BRAVA.

Origin.—Chondodéndron tomentósum, *Ruiz et Pavon. Natural order,* Menispermaceæ, Tinosporeæ.

Habitat.—Brazil.

Description.—Subcylindrical, somewhat tortuous pieces, about 10 to 15 centimeters (4 to 6 inches) long, varying in thickness between 2 and 10 centimeters (¾ and 4 inches); externally dark brown-gray, with transverse ridges and fissures and longitudinal furrows; internally pale brown, porous; the fresh cut of a waxy lustre; inodorous, bitter.

Pieces having a bright yellow color, or with a grayish, hard, nearly tasteless wood, should be rejected.

Structure.—Bark thin, with a thin cork. Wood in two or more somewhat irregularly concentric circles, which are separated by layers, composed of parenchyme, stone cells, and compressed cells; the central circle occupied by about 12 wood-wedges, containing large ducts, separated by somewhat narrower medullary rays, and terminating by a semicircular line of compressed cells; the subsequent circles have the same structure, but a larger number of wood-wedges and medullary rays.

Admixtures and Substitutions.—Pareira brava is not unfrequently mixed with sections of the *stem*, which has a rather thicker bark, when young, dotted with black warts, nearly regular zones of wood-wedges, and a small central pith; taste bitterish; otherwise resembles the root.

False Pareira brava.—*a.* Wood hard, very excentric, in separate circles and sections of circles, grayish, the fresh cut not waxy; bark thin, slightly bitter. Origin unknown.

b. Wood hard, pale brown, nearly concentric, separate circles; bark thin, nearly tasteless; otherwise resembling the preceding. Origin unknown.

c. Bark blackish; wood whitish, amylaceous, tasteless; derived from Abúta rufĕscens, *Aublet* (Menispermaceæ, Cocculeæ).

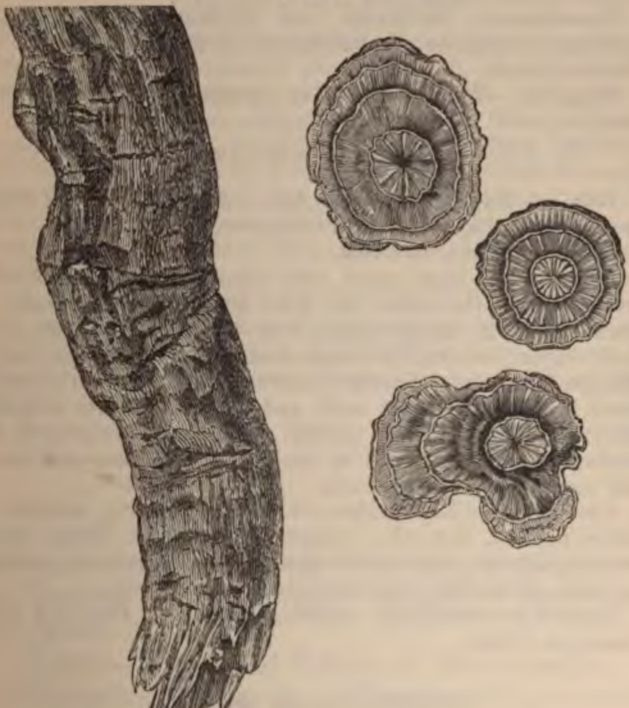
d. Wood hard, very excentric, in separate circles and sections of circles, bright yellow like the thin bark; bitter. It contains berberine or a closely allied alkaloid, and is probably derived from Abúta amára, *Aublet.* Habitat, Brazil.

e. Root resembling true pareira, but readily crumbling into pieces on cutting; wood-rays terminating with a nearly circular layer of compressed cells. Origin not determined.

Constituents.—Pelosine, about 0.5 per cent., identical with beberine and buxine; little tannin, ash 4 to 5 per cent.

Properties.—Diuretic, tonic. *Dose*, 2 to 4 grams (ʒss–j).

FIG. 59.



Pareira brava.—Portion of a root, and transverse sections of the same.

BERBERIS.—Barberry.

Radix berberidis.

Origin.—Bérberis vulgáris, *Linné.* *Natural order,* Berberideæ, Berbereæ.

Habitat.—Europe and Western Asia; naturalized in North America.

Description.—Much branched, sometimes 5 centimeters (2 inches) thick, hard and tough, brownish, internally yellow, with a rather thin, foliaceous bark, and thick, light yellow wood; inodorous, bitter.

Constituents. — Berberine (see Hydrastis), oxyacanthine (vinetine or berbine), berbamine, and a fourth alkaloid. See Barberry bark.

Properties.—Tonic. *Dose,* 2 to 4 grams (ʒss–j) in decoction, etc.

BAPTISIA.—Wild Indigo.

Origin.—Baptísia tinctória, *Robert Brown.* *Natural order,* Leguminosæ, Papilionaceæ, Podalyrieæ.

Habitat.—North America.

Description.—Head short, with knotty branches, and with several roots; the latter are bent, little branched, about 50 centimeters (20 inches long), from 3 to 12 millimeters (⅛–½ inch) thick; externally brown, somewhat warty and scaly; fracture tough and fibrous; internally whitish; bark rather thick, with a thin brown cork, and tough bast fibres in radial lines; wood tough, finely porous; medullary rays narrow, indistinct; inodorous; taste of bark bitterish, somewhat acrid and nauseous; wood tasteless.

Constituents.—Baptitoxine or baptisine (acrid, soluble in water, alcohol, and ether, poisonous), baptisin (bitter, indifferent glucoside, insoluble in water), baptin (acicular, soluble in water, glucoside, purgative), resin, starch, etc.

Properties.—Stimulant, emetic, cathartic. *Dose,* 0.3 to 1 gram (gr. v–xv).

STATICE.—Marsh Rosemary.

Origin.—Státice Limónium, *Linné,* var. caroliniána, *Gray.* *Natural order,* Plumbagineæ, Staticeæ.

Habitat.—North America, near the coast.

Description.—Several-headed, 30 to 60 centimeters (12 to 24 inches) long, 25 millimeters (1 inch) or more thick, annulate above, branched and wrinkled below, compact, tough, purplish-brown externally, lighter internally, with a rather thick bark and narrow, yellowish wood-wedges; inodorous, strongly astringent, and slightly bitter.

Constituents.—Tannin 14–18 per cent., mucilage, sugar, etc.

Properties.—Astringent. *Dose,* 0.5 to 2 grams (gr. viij–xxx).

Baycuru root, probably from Státice brasiliénsis, resembles the above, and has similar properties; it is said to contain a crystalline alkaloid.

CEANOTHUS.—RED ROOT.

Origin.—Ceanóthus americánus, *Linné* (New Jersey tea). *Natural order,* Rhamnaceæ, Rhamneæ.

Habitat.—North America in dry woodlands.

Description.—Head simple or branched, knotty-tuberculate; root about 30 centimeters (12 inches) long, and above 10 to 25 millimeters ($\frac{2}{5}$–1 inch) thick, contorted, somewhat branched, rust-brown, finely wrinkled, fracture granular through the thin rust-colored bark; wood tough, pale brown-red, with fine medullary rays; inodorous; bitter and astringent.

Constituents.—Tannin (6.5 per cent. in bark), ceanothine (crystalline, best solvent is chloroform; reduces gold chloride; red-brown by H_2SO_4; blue by Froehde's reagent; does not readily form salts), starch, sugar, mucilage, red coloring matter, ash 2–3 per cent.

Properties.—Astringent, tonic. *Dose,* 0.6 to 2 grams (gr. x–xxx).

KRAMERIA.—RHATANY.

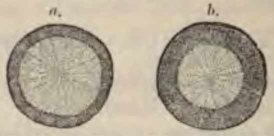
Origin.—1. Kraméria triándra, *Ruiz et Pavon,* and, 2. Kraméria tomentósa, *Saint Hilaire. Natural order,* Polygaleæ.

Habitat.—1. Peru and Bolivia; 2. New Granada.

Description.—About 25 millimeters (1 inch) thick, knotty and several headed above, branched below, the branches thinner and long; bark smooth or scaly, deep rust-brown, about 2 millimeters ($\frac{1}{12}$ inch) thick, very astringent, inodorous; wood pale brownish, tough, finely radiate, nearly tasteless; bark of branches about $\frac{1}{8}$ or $\frac{1}{6}$ the diameter.

The root of Krameria tomentosa (Savanilla rhatany) is less knotty, more slender, and has a dark brown-purplish, somewhat scaly bark, about 3 millimeters ($\frac{1}{8}$ inch) thick; bark of branches about $\frac{1}{5}$ to $\frac{1}{4}$ the diameter.

FIG. 60.



Transverse section of—*a.* Peruvian, *b.* Savanilla rhatany root.

Structure.—Cork rather thick; parenchyme of bark dotted, contains starch; bast bundles small, forming interrupted lines; medullary rays in the finely porous wood very narrow.

Varieties.—1. *Peruvian or Payta rhatany*, and, 2. *Savanilla rhatany.* Described above.

3. *Para or Brazilian rhatany.* Probably from Kr. argéntea, *Martius.* Resembles Savanilla rhatany; but is more blackish, less of a purple tint, very flexible; bark transversely fissured and somewhat warty.

4. *Guayaquil rhatany*, described by Holmes (1886). Origin unknown; root large, woody, contorted; bark comparatively thin, fibrous, rich in tannin, reddish-brown, the surface striated and warty.

5. Kraméria secundiflóra, *De Candolle*, of Texas, and Kr. lanceoláta, *Torrey*, of Florida, have thin dark brown roots with thick bark, rich in tannin. Not found in commerce.

Constituents.—Kramero-tannic acid about 20 per cent., rhatanic red, starch. The tannins differ somewhat in chemical behavior. In alcoholic tincture Payta rhatany yields a red-brown, but Savanilla or Para rhatany a bluish-gray, precipitate with lead acetate.

Properties.—Astringent. *Dose,* 0.5 to 2 grams (gr. viij–ʒss) in powder (rarely), syrup, tincture, extract.

2. RHIZOMES.—RHIZOMATA.

Rhizomes are stems remaining wholly or partly under ground, and are mainly distinguished from roots by the presence of scaly leaves or of sheathing leaf-bases or their scars, whereby they, or at least their younger portion, acquire a more or less annulated appearance. Rhizomes grow mostly in a horizontal or oblique direction, and produce overground stems from lateral buds, or more generally from buds terminating the branches, the rhizome elongating from a lateral bud; thus the stem-scars are found mostly on the upper side of the rhizome, while the rootlets are mainly on the lower side. A few of the officinal rhizomes have a perpendicular growth, are on all sides uniformly surrounded by rootlets, and on the lower end are more or less truncate. Branches, if present, emanate from the axils of leaf-scars.

Histology.—The rhizomes of cryptogamous plants (ferns) consist of parenchyme, in which a few, more or less laterally elongated, not wedge-shaped, vascular bundles are imbedded, sometimes arranged in a loose circle, each bundle being surrounded by an endoderm.

The rhizomes of monocotyledons consist of a circle of parenchyme, the cortical layer, followed toward the interior by a circular row of thick-walled cells, the nucleus sheath or endoderm, and inclosing a cylinder of parenchyme in which wood-bundles are irregularly scattered, and these are often most abundant near the nucleus sheath; in some cases wood-bundles are also observed in the outer layer.

The rhizomes of dicotyledons have usually the epidermis replaced by a layer of cork; the bark consists of an outer and an inner layer, the latter being the liber, and is separated by a thin layer of cambium from the wood, which is circularly arranged in more or less distinctly wedge-shaped masses, and these alternate with medullary rays and inclose a circular pith. Some of the dicotyledonous rhizomes, like valerian, contain an endoderm, which is also observed in the rootlets of some of these drugs.

Classification.

Sect. 1. Cryptogamous Rhizomes.	
Rhizome densely covered with stipes, and between these with brown silky chaff.	Aspidium.
Sect. 2. Monocotyledonous Rhizomes.	
Collected without rootlets.	
Aromatic and pungent.	
Peeled or unpeeled, flattish, lobed, with numerous oil-cells.	Zingiber.
Usually in disks, light reddish or brown-gray, with oil-cells.	Zedoaria.
Cylindrical, annulate, branched, reddish-brown; internally whitish, with oil-cells.	Galanga.
Globular pyriform, or more frequently cylindrical, gray; internally orange-yellow, horny.	Curcuma.
Aromatic and bitter, flattish-cylindrical, on the lower side with scars of rootlets in wavy and branched lines.	Calamus.
Odor of violets, bitterish, white, consisting of flattened, club-shaped joints.	Iris florentina.
Taste sweet; thin, straw-yellow, internally whitish, spongy, hollow in centre.	Triticum repens.
Taste bitterish, acrid; thin, brown-gray, under the epidermis a circle of large air-tubes.	Carex arenaria.
Taste bitterish; thick, tuberous, tuberculated, reddish-brown; internally whitish-brown, dotted.	Smilax China.

Taste acrid, tingling; obconical, brown, surrounded by scars of rootlets; internally whitish, with short curved wood-bundles.	Veratrum album.
Collected with rootlets.	
Taste acrid, tingling; obconical, brown, surrounded by shrivelled, lighter-colored, simple rootlets; internally whitish, with short curved wood-bundles.	Veratrum album and Ver. viride.
Resembling the preceding, but of larger dimensions, dark gray, and, when rubbed, of a disagreeable odor.	Dracontium.
Taste sweetish, astringent, bitter, and acrid; subglobular or obconical; wood-bundles curved.	Trillium.
Taste bitter; short, cylindrical; wood-bundles crowded near centre.	Chamælirium.
Taste amylaceous, bitter; short, cylindrical, jointed.	Aletris.
Taste acrid; brown, consisting of cylindrical joints, which are flattened above.	Iris versicolor.
Taste bitterish, slightly acrid; long, thin, subcylindrical; little branched, brown; on upper side with approximate cup-shaped stem-scars.	Cypripedium.
Long, thin, cylindrical, branched, whitish, with rather distant stem-scars above.	Convallaria.
Resembling the preceding, but thicker and jointed between the stem-scars.	Polygonatum.
Taste acrid; flattish cylindrical, bent and branched; whitish, hard.	Dioscorea.
Sect. 3. Dicotyledonous Rhizomes.	
Collected with few or no rootlets.	
Short, leaf-scars approximate.	
Acrid; cylindrical, deep brown-red; internally white, with numerous red resin-cells.	Sanguinaria.
Astringent; cylindrical, brown; internally reddish; bark thin; wood-wedges small; medullary rays broad.	Geranium.
Astringent; irregularly conical, pitted, brown; internally reddish; bark thick; wood-wedges small; medullary rays broad.	Tormentilla.
Astringent; S-shaped, flattish, red-brown; internally reddish; bark thick; wood-wedges small, numerous; medullary rays narrow.	Bistorta.

Long horizontal, leaf-scars mostly distant.	
Mucilaginous, bitter, and astringent; grayish, spongy, wood-bundles scattered; disks or sections.	Nymphæa.
Somewhat bitter and acrid; composed of joints, terminated by a broad cup-shaped scar on upper side, and a tuft of rootlets underneath.	Podophyllum.
Cylindrical, somewhat tuberculate, with laticiferous vessels.	Asclepias Cornuti.
Somewhat aromatic, sweetish; cylindrical, annulate above.	Aralia nudicaulis.
Very pungent, cylindrical.	Armoracia (see Roots).
Collected with rootlets.	
Rhizomes short, upright or mostly oblique, often knotty.	
Aromatic, more or less pungent.	
Upright, subglobular, or obconical; internally brownish, waxy, with small wood-wedges.	Valeriana.
Cylindrical, oblique, or horizontal; wood circle narrow; in bark of rhizome and rootlets, near the wood, a circle of resin cells.	Arnica.
Thin cylindrical, oblique, with projecting stem-scars on upper side and numerous rootlets beneath; wood somewhat excentric.	Serpentaria.
Thin cylindrical, with deeply cup-shaped stem-scars on upper side and numerous rootlets beneath, wood excentric.	Spigelia.
Slightly aromatic, bitter, and astringent.	
Subcylindrical, oblique, with fragile rootlets; wood soft, pith brown-gray.	Geum rivale.
Subcylindrical or obconical, with numerous fragile rootlets; wood rather hard; pith reddish; odor clove-like.	Geum urbanum.
Not aromatic; bitter or somewhat acrid, wood (except in Hydrastis) prominent, hard.	
Subglobular; wood white; rootlets numerous, brittle; pale brown.	Asclepias incarnata.
Obconical or oblique and short-jointed; yellowish-gray; internally bright yellow.	Hydrastis.
Horizontal, short-branched, matted; stem-scars broad; brown; tough.	Caulophyllum.

Very knotty and hard; brown-gray; stem-scars shallow.	Collinsonia.
Irregular tuberculate, blackish-brown, waxy; wood-bundles rather distant; wood of rootlets somewhat hexagonal.	Helleborus niger.
Like preceding, somewhat smaller; wood-bundles approximate in about four distant groups; wood of rootlets with four short rays.	Helleborus viridis.
Like the following, but smaller.	Actæa alba.
Stout branches ascending, black-brown, hard; wood-wedges approximate; wood of rootlets with four long rays.	Cimicifuga.
Stout knotty-cylindrical, gray-brown, hard; scars concave; medullary rays fine.	Triosteum.
Knotty, red-brown; rootlets more or less annulate; resinous dotted in the bark.	Gillenia.
Elongated, mostly not knotty.	
Aromatic; knotty from prominent stem-scars; roots long.	Aralia racemosa.
Aromatic; pungent; quadrangular or two-edged, thin, gray-brown; bark thick; wood-wedges small; pith large.	Asarum.
Bitter, slightly acrid; flattened, branched, black-brown; bark thin; wood thick, tough; pith brownish.	Leptandra.
Bitter; cylindrical, pale yellowish-brown; internally bright yellow; wood tough; pith small.	Xanthorrhiza.
Bitter; often knotty; yellowish-brown; tough.	Berberis aquifolium.
Aromatic, bitter; cylindrical, light brown; bark thin; wood hard; pith small.	Gelsemium (see Roots).
Sweet; cylindrical, brownish; internally tawny-yellow; bark rather thick; wood large-porous.	Glycyrrhiza (see Roots).
Sweetish, slightly acrid; cylindrical or in powder; deep red.	Rubia (see Roots).
Bitter; cylindrical, yellowish-brown; internally yellowish; woody zone narrow, tough; pith prominent, somewhat excentric.	Menispermum.

ASPIDIUM.—ASPIDIUM.

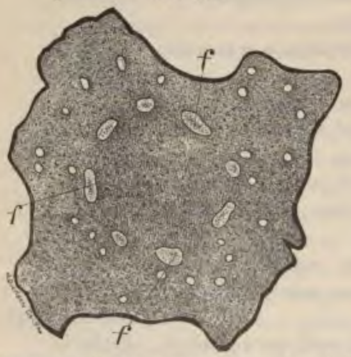
Male fern.

Origin.—1. Aspídum Fílix-mas, *Swartz*, and, 2. Aspídium marginále, *Willdenow*. *Natural order*, Filices, Polypodiaceæ.

Habitat.—1. North America (Canada, Northern Michigan, Dakota, to the Rocky Mountains), Northern Asia, and Europe. 2. North America south to the mountains of North Carolina.

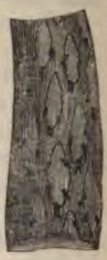
Description.—From 7 to 15 centimeters (3 to 6 inches) long, 15 to 25 millimeters ($\frac{3}{5}$ to 1 inch) thick, and, together with the closely imbricated dark brown stipe remnants, 50 or 65 millimeters (2–$2\frac{1}{2}$ inches) in diameter, and densely covered with brown, glossy, transparent, and soft chaffy scales; fracture short and cork-like; internally pale green, rather spongy; the vascular bundles about 10 (A. Filix-mas) or 6 in number (A. marginale), arranged in an interrupted circle outside of which a variable number of small scattered bundles are found; odor slight, disagreeable;

FIG. 61.



Filix-mas.—Transverse section, magnified 3 diam. *f*. Vascular bundles.

FIG. 62.



Surface of peeled rhizome.

taste sweetish, somewhat astringent and bitter, acrid and nauseous.

When used, the chaff, together with the dead portions of the rhizome and stipes, must be removed, and only such portions as have retained their green color should be employed.

Structure.—The parenchyme is thin-walled, and contains minute starch grains and green oil, and in the intercellular spaces short-stalked oil glands. The vascular bundles consist largely of scalariform ducts.

Constituents.—Fixed oil 6–7 per cent., filitannic acid, filixred, chlorophyll, filicin, $C_{35}H_{40}O_{12}$, and filicic acid, $C_{35}H_{42}O_{13}$. Filicin or filicic anhydride is not poisonous, is crystalline, soluble in chloroform, benzol, fixed and volatile oils, less soluble in ether and alcohol, insoluble in water; melts at 184.5° C.; yields with fusing potassa, butyric acid and phloroglucin. Filicic acid is white, amorphous, tasteless, more freely soluble than its anhydride, straw-yellow at 100°, melts at 125°, is anthelmintic and poisonous. The constituents named are contained in Oleoresina filicis. Ash 2–3 per cent.

Properties.—Tænifuge. *Dose,* 2 to 8 grams (ʒss–ij), or the oleoresin, 0.3 to 1 gram (gr. v–xv).

Allied drugs.—Aspídium rígidum, *Swartz,* indigenous to Europe and California. The rhizome is longer and thinner than male fern, has the stipes loosely imbricate, and contains 6 vascular bundles.

Aspídium athamánticum, *Kunze,* panna-panna, uncomocomo, from Southern Africa; thicker and firmer than male fern; internally brownish, with black resin-dots and broader vascular bundles.

Substitutions.—The rhizomes of most indigenous ferns are thinner, the stipes rarely closely imbricate, and usually free from, or with very little, chaff.

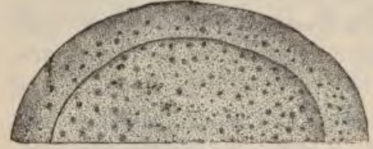
ZINGIBER.—GINGER.

Origin.—Zíngiber officinále, *Roscoe. Natural order,* Scitamineæ, Zingibereæ.

Habitat.—India; cultivated in the tropics.

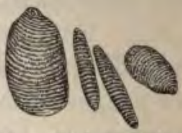
Description.—Flattish, about 15 millimeters ($\frac{3}{5}$ inch) broad, on one side lobed or clavately branched; deprived of the epidermal layer, pale buff-colored, striate; breaks with a mealy rather fibrous fracture; internally whitish, with numerous small orange-colored dots and a distinct nucleus sheath; aromatic and spicy, of a pungent and warm taste.

FIG. 63.



Zingiber.—Transverse section, magnified 3 diam.

FIG. 64.

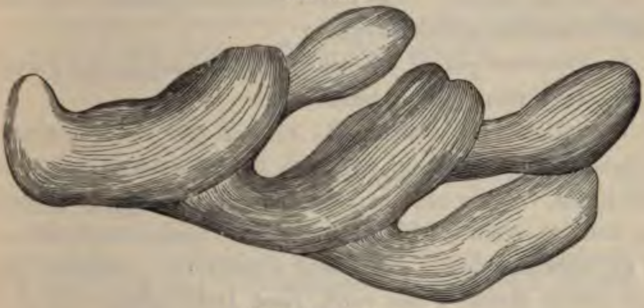


Ginger starch-granules, magnified 250 diam.

Structure.—The tissue consists mainly of parenchyme containing flattened starch-granules, and is, in coated ginger, surrounded by a layer of tangentially elongated cells, resembling those of the nucleus sheath. The resin cells are scattered through the tissue, and the fibro-vascular bundles are most numerous within the circle of the nucleus sheath. The cortical layer is much thinner than the central cylinder.

Varieties.—Coated and uncoated ginger; the latter deprived of the epidermal layer; the former sometimes distinguished as *black* ginger—a designation more properly restricted to the rhizome, which, before drying, has been steeped in boiling water, and, when dry, breaks with a horny, blackish, somewhat diaphanous fracture, due to the pasty condition of the starch. The commercial varieties are designated from the country of production.

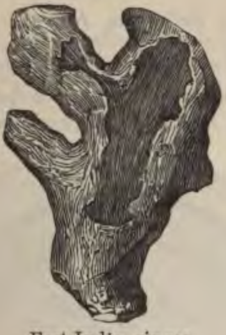
FIG. 65.



Jamaica ginger.

1. *Jamaica ginger*. The kind described above; sometimes the rhizome has been steeped in milk of lime, and is covered with a white powder of calcium carbonate.

FIG. 66.



East India ginger.

2. *African ginger*. Coated with a light brown or gray-brown suberous tissue, rhizome shorter, the lobes broadly linear or oblong.

3. *Chinese ginger.* Coated, rhizome shorter, the lobes stumpy.

4. *East India ginger.* Coated on the edges, the flat sides deprived of the epidermal layer.

5. *Green ginger.* The lobed branches recently dug and sent to market without drying.

6. *Preserved ginger.* Fresh ginger steeped in hot syrup; it is soft, brown-yellow, translucent.

Constituents.—Volatile oil, 1 to 2 per cent., gingerol (viscid inodorous liquid, to which the hot taste is due, soluble in fat, volatile oil, alcohol, ether, very sparingly soluble in benzin), resin (yields protocatechuic acid), starch 20 per cent., mucilage, etc.; ash about 4 per cent. Jamaica ginger yields about 5 per cent., East India ginger about 8 per cent. of oleoresin.

Properties.—Carminative, stimulant, sternutatory, rubefacient, anodyne. *Dose,* 0.3 to 2 grams (gr. v–xxx), in powder or tincture.

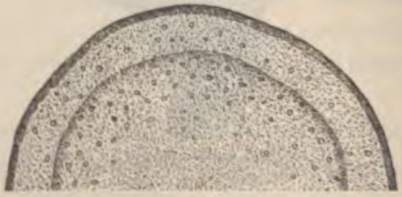
ZEDOARIA.—ZEDOARY.

Origin.—Cúrcuma Zedoária, *Roscoe.* *Natural order,* Scitamineæ, Zingibereæ.

Habitat.—India.

Description.—Circular disks of a tuber, 1 to 4 centimeters (⅖ to 1⅗ inches) in diameter, orange-brown; internally pale reddish gray-brown, with numerous brown-yellow resin cells, and lighter colored wood-bundles, the latter most numerous

FIG. 67.



Zodoaria.—Transverse section, magnified 3 diam.

within the nucleus sheath, which separates the central portion from a much thinner cortical layer; fracture short, somewhat mealy, and slightly horny; odor and taste ginger-like.

Yellow zedoary, the pear-shaped tuber of Zíngiber Cassumúnar, *Roxburgh*, has a more camphoraceous odor and bitterish taste.

Constituents.—Volatile oil $\frac{1}{2}$ to 1 per cent., resin (to which the pungent taste is due), starch, mucilage, etc.

Properties and Dose.—Like ginger.

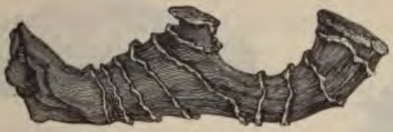
GALANGA.—GALANGAL.

Origin.—Alpínia officinárum, *Hance.* *Natural order,* Scitamineæ, Zingibereæ.

Habitat.—China.

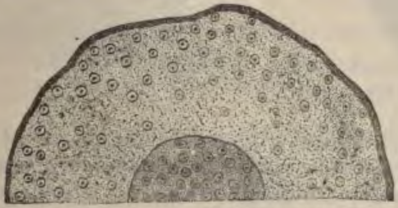
Description.—Cylindrical, branched, about 5 centimeters (2 inches) long and 15 millimeters ($\frac{3}{5}$ inch) thick, annulate by somewhat distant leaf-sheaths, rust-brown; fracture short, somewhat fibrous; internally brownish-white, with numerous brown-yellow resin cells and brownish wood-bundles which are scattered in the outer layer and approximate in the equally thick central portion: odor and taste ginger-like.

FIG. 68.



Galanga.

FIG. 69.



Galanga.—Transverse section, magnified 3 diam.

The *larger galangal* from Alpínia Galánga, *Swartz* (India), which is of larger dimensions and of a more reddish tint externally, is now not an article of commerce.

Constituents.—Volatile oil $\frac{1}{2}$ per cent., resin, fat, galangol (soft, very pungent, inodorous), three yellow tasteless crystalline principles (kempferid, galangin, alpinin), starch, mucilage, etc., ash about 4 per cent.

Properties and Dose.—Like ginger.

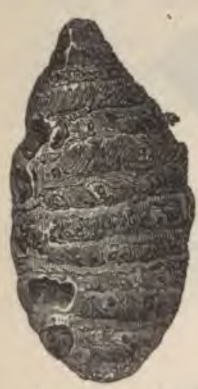
CURCUMA.—TURMERIC.

Origin.—Cúrcuma lónga, *Linné.* *Natural order*, Scitamineæ, Zingibereæ.

Habitat.—Southern Asia; cultivated.

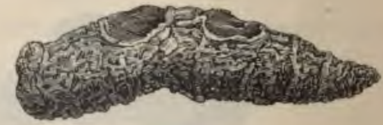
Description.—Oval or oblong, 2.5 to 5 centimeters (1–2 inches) long and about one-half as thick (round turmeric); or cylindrical branches about 1 centimeter ($\frac{2}{5}$ inch) thick (long turmeric); sometimes cut longitudinally or transversely; externally yellowish-gray, somewhat annulate; internally orange-yellow or brown-yellow, with a circular nucleus sheath; the cortical layer about one-half the thickness of the central cylinder; fracture flattish, resinous, glossy; odor slight ginger-like; taste warm, aromatic, and bitterish; powder deep yellow, turning brown-red by alkalies and borax.

FIG. 70.



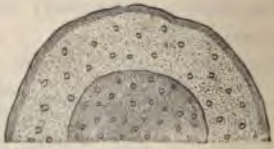
Round turmeric.

FIG. 71.



Long turmeric.

FIG. 72.



Curcuma.—Transverse section, magnified 3 diam.

Varieties.—1. *Chinese turmeric.* Central rhizomes and branches.

2. *Bengal turmeric.* Slender branches, reddish.

3. *Madras turmeric.* Thick branches and transverse sections of central rhizomes.

4. *Java turmeric.* Rather small central rhizomes and branches, usually cut transversely and longitudinally.

5. *Cochinchina turmeric.* Sections of large diameter, rough externally.

Constituents.—Volatile oil 1 per cent., viscid oil 11 per cent. (containing aromatic turmerol), a little pungent resin, curcumin, pasty starch, mucilage, etc.

Curcumin, $C_{14}H_{14}O_4$, is orange-yellow, resinous, insoluble in water and benzin, soluble in alcohol and ether, also with a red-brown color in alkalies; red-brown by boric acid; sparingly soluble in benzol and carbon disulphide.

Properties.—Stimulant, tonic; used for coloring ointments and tinctures, and for the detection of alkalies and borates.

CALAMUS.—Calamus.

Sweet flag.

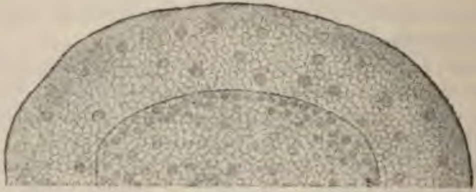
Origin.—A′corus Cálamus, *Linné.* *Natural order,* Aroideæ, Orontieæ.

Habitat.—Europe and North America, on the banks of streams and ponds.

Description.—The unpeeled rhizome is directed. It grows horizontally, 1 meter (40 inches) or more in length; in commerce it is cut in sections of various length, subcylindrical, about 2 centimeters ($\frac{4}{5}$ inch) broad; externally reddish-brown (when peeled pinkish-white), deeply wrinkled, somewhat annulate, or the upper surface marked with the oblique leaf-scars or their fibro-vascular bundles, forming triangles; on the lower surface marked with the circular scars of the rootlets in wavy longitudinal lines; whitish internally, of a spongy texture, breaking with a short corky fracture, showing numerous yellowish and brownish dots on both sides of the elliptic nucleus sheath; odor aromatic; taste strongly bitter.

Structure.—The predominating tissue is parenchyme containing numerous large air-passages; the cells are filled with starch or with oil, the latter being more numerous in the thick cortical zone. The yellowish fibro-vascular bundles are most numerous within and near the nucleus sheath, the latter consisting of rather thin-walled cells.

FIG. 73.



Calamus.—Transverse section, magnified 3 diam.

Constituents.—Volatile oil 1–2 per cent., acorin about 0.2 per cent., choline, calamine (minute quantity), resin, starch, mucilage. Acorin of Thoms (1886) is a thick honey-yellow neutral liquid, faintly aromatic, very bitter, insoluble in water, soluble in alcohol, chloroform, and ether. The bitter principle appears to be crystallizable and precipitated by tannin (Flückiger).

Properties.—Stimulant, carminative, tonic. *Dose,* 1 to 4 grams (gr. xv–ʒj), in powder, infusion, and tincture.

IRIS FLORENTINA.—FLORENTINE ORRIS.

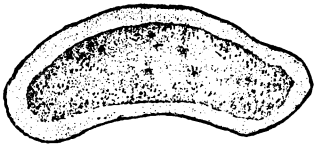
Origin.—I'ris florentína, *Linné,* I. pállida, *Linné,* and I. germánica, *Linné,* chiefly the last two species. *Natural order,* Irideæ, Moræeæ.

Habitat.—Northern Italy; cultivated.

Description.—Of horizontal growth; flattened, consisting of joints, 5 to 10 centimeters (2 to 4 inches) long, broadest near the upper extremity, and terminated by a circular scar; peeled, of a whitish color; on the upper side with small fibro-vascular bundles in transverse lines; on the lower side with numerous circular brownish scars of the rootlets; fracture short, somewhat mealy; nucleus sheath prominent in lower half; wood-bundles scattered, crowded within the nucleus sheath; odor violet-like; taste mealy, bitterish, and slightly acrid.

Long, rather slender joints are selected for the use of teething infants, trimmed smoothly and frequently whitened by chalk or magnesia.

FIG. 74.



Iris florentina.—Transverse section.

Constituents.—Volatile oil, resin, fat, starch, mucilage, bitter extractive. *Oil of orris*, about 0.1 per cent., distilled by means of superheated steam, is solid at ordinary temperatures, has an agreeable violet odor, and consists chiefly of myristic acid mixed with a little thickish volatile oil.

Properties.—Errhine, diuretic, in fresh state irritant; used chiefly in dentifrices and perfumery. *Dose*, 0.3 to 1 gram (gr. v–xv).

TRITICUM REPENS.—COUCHGRASS.

Triticum, *U. S.;* Rhizoma (Radix) graminis.—Quitchgrass, Quickens.

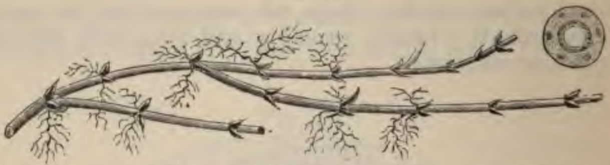
Origin.—Tríticum (Agropy′rum, *Beauvais*) répens, *Linné*. *Natural order*, Gramineæ, Hordeeæ.

Habitat.—Europe and North America.

Description.—Very long and creeping, the internodes about 5 centimeters (2 inches) long, cut in sections about 1 centimeter ($_{5}$ inch) long, about 2 millimeters ($\frac{1}{12}$ inch) thick, smooth but wrinkled, straw-yellow, hollow in the centre; inodorous, sweet.

It should be gathered in autumn or in early spring and deprived of the rootlets.

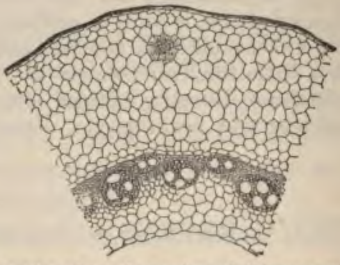
FIG. 75.



Triticum repens.—Rhizome and transverse section, magnified 3 diam.

Structure.—The cortical zone consists of large parenchyme cells, with about six small wood-bundles, and is free from starch. The woody zone is narrow and yellowish, and incloses a narrow circle of parenchyme, the remnant of the medullary centre.

FIG. 76.



Triticum repens.—Section through portion of rhizome, magnified 65 diam.

Constituents.—Glucose, fruit-sugar, inosit, triticin (about 8 per cent., resembles inulin), mucilage, malates; ash about 5 per cent. Lactic acid and mannit are found in the extract as products of fermentation.

Properties.—Diuretic, aperient. *Dose,* 2 to 8 grams (ʒss–ij), in decoction and as extract.

CAREX ARENARIA.—Red Sedge.

Radix sarsaparillæ germanicæ, Radix graminis rubræ.

Origin.—Cárex arenária, *Linné.* *Natural order,* Cyperaceæ, Cariceæ.

Habitat.—Central and Northern Europe, near the coast.

Description.—Horizontal, long, internodes 1 to 3 centimeters (⅖ to 1⅕ inch) long, angularly furrowed, brown-gray, the nodes fringed with leaf-sheaths and marked with scars and remnants of rootlets; internally with a large centre containing numerous approximate wood-bundles, and surrounded by a circle of large air-passages; nearly inodorous, sweetish, somewhat bitter, and acrid.

Constituents.—Acrid and bitter principle, sugar, resin, starch.

Properties.—Alterative; used similarly to sarsaparilla.

Substitutions.—The rhizomes of many other species of Carex are destitute of the large air-passages, and in many the wood-bundles in the central portion are surrounded by broad layers of parenchyme.

SMILAX CHINA.—China Root.

Origin.—Smílax Chína, *Linné.* *Natural order,* Liliaceæ, Smilaceæ.

Habitat.—China, Japan.

Description.—Irregularly tuberous, about 10 or 15 centimeters (4 or 6 inches) long and 3 to 5 centimeters (1⅕ to 2 inches) thick, tuberculate by short branches, reddish-brown; internally whitish, mealy, with numerous small brown resin cells, and near the centre with many scattered wood-bundles, but without a nucleus sheath; inodorous, insipid, afterward bitterish, and slightly acrid.

Substitutions.—Smílax pseudochína, *Linné,* Central and Southern North America. Smaller, less tuberculate, rather spongy, and with few resin cells.

The tubers of Smílax glaúca, *Walter,* are yellowish or pale brownish, spongy, and destitute of resin cells.

Constituents.—Smilacin, resin, starch, a little tannin.

Properties.—Alterative; used similarly to sarsaparilla.

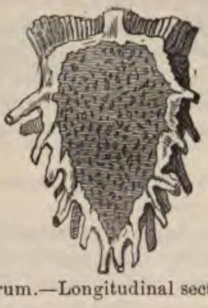
VERATRUM ALBUM.—White Veratrum.

Origin.—Verátrum álbum, *Linné.* *Natural order,* Liliaceæ, Veratreæ.

Habitat.—Europe, in mountainous regions.

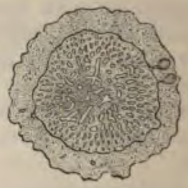
Description.—It closely resembles American veratrum in all essential characters. Formerly it consisted only of the rhizome, deprived of its rootlets; but the latter are now present, as directed by the German Pharmacopœia.

FIG. 77.



Veratrum.—Longitudinal section.

FIG. 78.



Veratrum.—Transverse section.

Constituents.—Jervine, pseudojervine, rubijervine, veratralbine (amorphous), veratroidine, protoveratridine, veratrine (?), jervic acid (identical with chelidonic acid), resin, sugar, veratramarin (yellow, deliquescent, bitter, present in minute quantity).

Properties.—Emetic, cathartic, errhine, poisonous. *Dose,* 0.06 to 0.12 gram (gr. j–ij), in powder, mostly externally as ointment in itch, and mixed with an inert powder as snuff.

VERATRUM VIRIDE.—AMERICAN VERATRUM.

Origin.—Verátrum víride, *Aiton,* nearly allied to Verát. álbum, var. Lobeliánum, *Bernhardi,* of Europe. *Natural order,* Liliaceæ, Veratreæ.

Habitat.—North America, in rich woods.

Description.—Closely resembles white veratrum. Rhizome obconical, mostly simple, 5 to 8 centimeters (2–3 inches) long, 2 to 3 centimeters ($\frac{4}{5}$–$1\frac{1}{5}$ inch) thick, tufted above, truncate below, externally blackish-gray, and invested on all sides with numerous shrivelled light yellowish-brown rootlets, which are about 20 centimeters (8 inches long) and about 3 millimeters ($\frac{1}{8}$ inch) thick; internally whitish with numerous darker colored dots and short wavy lines within the nucleus sheath; inodorous, bitter, very acrid, sternutatory.

Structure.—Cortical zone about $\frac{1}{7}$ of the diameter of the rhizome, consists of parenchyme, containing starch and occasionally calcium oxalate, and has few short-curved wood-bundles; nucleus sheath wavy, the inner cell-walls thickened; central portion like the cortical zone, but the wood-bundles numerous. The rootlets have a thick cortical zone consisting mainly of spongy parenchyme, the cells filled with starch or calcium oxalate; the brown nucleus sheath encloses a fibrovascular cord.

Constituents.—Resin, starch, and alkaloids. Jervine, $C_{26}H_{37}NO_3$, is crystalline, tasteless, not sternutatory, insoluble in water, benzin, and acetic ether, soluble in 270 parts absolute ether, 60 parts chloroform, and 17 parts absolute alcohol; turns gradually red with concentrated HCl, and on boiling yellowish; colored yellow and green by H_2SO_4, the salts insoluble in dilute mineral acids. Veratroidine is uncrystallizable, sternutatory, soluble in ether, chloroform, and benzol, colored yellow and red by H_2SO_4; pale red by concentrated HCl, and on boiling cherry-red. Pseudojervine resembles jervine, but its sulphate is more soluble in water. Rubijervine resembles veratroidine, but is not sternutatory. Cevadine is also contained in sabadilla seed.

Properties.—Emetic, diaphoretic, sedative, errhine. *Dose*, 0.06 to 0.12 gram (gr. j–ij) in powder, or preferable in tincture and fluid extract.

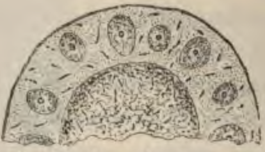
SYMPLOCARPUS.—Skunk Cabbage.

Origin. — Symplocárpus fœ'tidus, *Salisbury* (Dracóntium fœ'tidum, *Linné*). *Natural order*, Aroideæ, Orontieæ.

Habitat.—North America, in moist grounds.

Description.—Obconical, truncate above and below, 7 to 10 centimeters (3 to 4 inches) long, and about 5 centimeters (2 inches) in diameter, the upper half beset with numerous long shrivelled rootlets; gray-brown externally; internally whitish, with numerous short bent wood-bundles, which are crowded within the somewhat wavy nucleus sheath. When triturated, it emits a disagreeable odor, taste acrid, biting.

FIG. 79.



Dracontium.—Section through upper part, natural size.

Constituents.—Fat, resin, sugar, gum, starch; the acrid principle, which appears to be altered by heat, has not been isolated (see Arum).

Properties.—Emetic, diuretic, antispasmodic, stimulant. *Dose,* 0.3 to 1 gram (gr. v–xv), in recent powder or infusion.

TRILLIUM.—BETHROOT, BIRTHWORT.

Origin.—Tríllium eréctum, *Linné*, and other species of Trillium. *Natural order,* Liliaceæ, Medeoleæ.

Habitat.—United States, in damp woods.

Description.—Varying between subglobular and obconical, somewhat tufted above, truncate below, about 3 centimeters (1⅕ inches) long, annulate, orange-brown, rootlets light brown; internally whitish; fibrovascular bundles mostly near the circumference, curved or circular; inodorous; taste sweetish, astringent, bitter, and acrid.

Constituents.—Acrid glucoside (not precipitated by lead acetate, nearly insoluble in water), fixed oil, resin, tannin, starch, ash 2 to 3 per cent.

Properties.—Emmenagogue, emetic. *Dose,* 2 to 4 grams (ʒss–j).

CHAMÆLIRIUM.—STARWORT.

Origin.—Chamælírium lúteum, *Gray*, s. C. caroliniánum, *Willdenow*, s. Helónias dioíca, *Pursh*. *Natural order,* Liliaceæ, Narthecieæ.

Habitat.—North America, in low grounds.

Description.—About 25 millimeters (1 inch) long and 6 millimeters (¼ inch) thick, subcylindrical, closely annulate, gray-brown, on upper side few stem-scars, on lower side wiry rootlets; internally whitish; fracture smooth and horny; wood-bundles near the centre numerous; inodorous; taste bitter.

Constituents. — Starch, chamælirin, $C_{18}H_{32}O_9$ (yellowish glucoside, watery solution frothing, by sulphuric acid colored orange-red, crimson, brown, etc.)

Properties.—Tonic, diuretic, anthelmintic. *Dose,* 1 to 4 grams (gr. xv–ʒj).

ALETRIS.—Colicroot, Starwort.

Origin.—A'letris farinósa, *Linné.* *Natural order,* Hæmodoraceæ, Conostyleæ.

Habitat.—United States, in sandy woods.

Description.—About 30 millimeters (1⅕ inches) long, and 3 millimeters (⅛ inch) thick, flattened and tufted on upper side, convex, and with numerous wiry or whitish rootlets on the lower side; indistinctly jointed, brown-gray; fracture mealy, white, somewhat fibrous; inodorous; taste amylaceous, bitter.

Constituents.—Starch, bitter principle.

Properties. — Tonic, emetic, purgative. *Dose,* 0.6 gram (gr. x).

IRIS VERSICOLOR.—Blue Flag.

Iris, *U. S. P.*

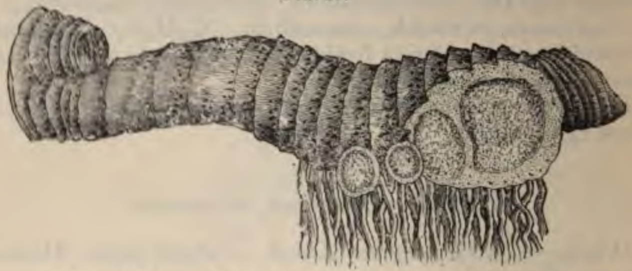
Origin.—I'ris versícolor, *Linné.* *Natural order,* Irideæ, Moræceæ.

Habitat.—North America, in swampy localities.

Description.—Rhizome of horizontal growth, consisting of joints, 5 to 10 centimeters (2 to 4 inches) long, cylindrical in the lower half, flattish, and about 2 centimeters (⅘ inch) broad near the upper extremity, and terminated by a circular scar, annulated from the leaf-sheaths, gray-brown; rootlets long, simple, crowded near the broad end; odor slight; taste acrid, nauseous.

Structure.—The predominating tissue is parenchyme, containing starch and some crystals. The nucleus sheath incloses most of the wood-bundles.

FIG. 80.



Iris versicolor.—Joint of rhizome and section of branches.

Allied drugs.—I′ris virgínica, *Linné*, Boston iris, and I. vérna, *Linné*, dwarf iris of the United States. The joints of the rhizome are about 25 millimeters (1 inch) long, and about 1 centimeter ($\frac{2}{5}$ inch) broad, brownish-gray; otherwise resembling the above.

Constituents.—Acrid resin, camphoraceous body, fat, sugar, gum, tannin, possibly an alkaloid.

Properties.—Alterative, diuretic, purgative, emetic. *Dose,* 0.3 to 1 gram (gr. v–xv), in powder, or the oleoresin, 0.06 to 0.12 gram (gr. j–ij).

CYPRIPEDIUM.—CYPRIPEDIUM.

American Valerian.

Origin.—Cypripédium pubéscens, *Willdenow,* and Cypr. parviflórum, *Salisbury.* *Natural order,* Orchideæ, Cypripedieæ.

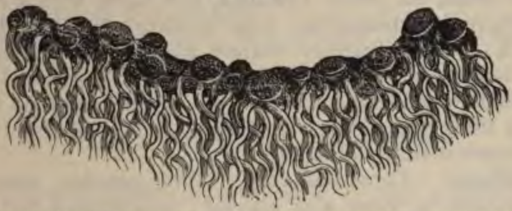
Habitat.—North America, in swampy places.

Description.—Of horizontal growth, bent, 10 centimeters (4 inches) or less long, about 3 millimeters ($\frac{1}{8}$ inch) thick; on the upper side with numerous circular cup-shaped scars;

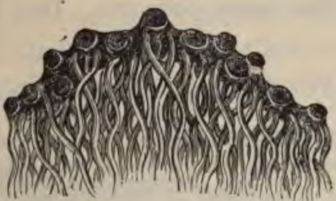
closely covered below with simple wavy rootlets, varying from 10 to 50 centimeters (4 to 20 inches) in length; brittle; dark brown or light orange-brown; fracture short, white; odor faint, but heavy; taste sweetish, bitter, and somewhat pungent.

Cypripedium parviflorum yields the shorter and thinner rhizome with orange-brown rootlets.

FIG. 81.



Cypripedium pubescens.—Rhizome and rootlets, natural size.



Cypripedium parviflorum —Rhizome and rootlets, natural size.

Structure. — Cortical parenchymatous zone thickish. Nucleus sheath indistinct. Wood-bundles approximate, near the centre more distant. The parenchyme contains starch.

Constituents.—Volatile oil (trace), fixed oil, volatile acid, resins, tannin, sugar, starch; the bitter principle appears to be a glucoside. Ash about 6 per cent.

Properties.—Diaphoretic, stimulant, antispasmodic. *Dose,* 0.5 to 1 gram (gr. viij–xv), in powder, infusion, or extract.

CONVALLARIA.—CONVALLARIA.

Lily of the valley.

Origin.—Convallária majális, *Linné.* *Natural order*, Liliaceæ, Convallarieæ.

Habitat.—United States, in the Alleghany mountains; Europe and Northern Asia.

Description.—Creeping and branched, about 3 millimeters ($\frac{1}{8}$ inch) thick, cylindrical, wrinkled, whitish, the internodes from 2 to 6 centimeters ($\frac{4}{5}$–$2\frac{1}{2}$ inches) long, marked with few circular scars, the joints annulate, and beset with a circle of 8 or 10 grayish, branching long rootlets, about 1 millimeter ($\frac{1}{25}$ inch) thick; fracture rather tough, somewhat fibrous, white; inodorous; taste sweetish, bitter and somewhat acrid; the rhizome contains a small number of fibrovascular bundles within a thick-walled nucleus sheath; the cortical and central parenchyme is thin-walled.

Constituents.—Convallamarin (white powder, sweet and bitter, soluble in water and alcohol; precipitated by tannin), and convallarin (acrid prisms; sparingly soluble in, but foaming with water); both are glucosides.

Properties.—Heart-tonic, poisonous. *Dose*, 0.1 to 0.4 gram (gr. jss–vj).

POLYGONATUM.—SOLOMON'S SEAL.

Origin.—Polygonátum biflórum, *Elliott*, and P. giganténum, *Dietrich.* *Natural order*, Liliaceæ, Polygonateæ.

Habitat.—North America, in woodlands.

Description.—Jointed and annulate, about 15 centimeters (6 inches) long, and 5 millimeters ($\frac{1}{5}$ inch) thick, somewhat flattened, each joint on the upper side with a circular concave stem-scar; pale brownish-yellow; fracture short; internally whitish, spongy; wood-bundles most numerous near the centre, not inclosed by a nucleus sheath; inodorous; taste mucilaginous, somewhat acrid.

Smilacína racemósa, *Desfontaines*, false Solomon's seal, has the circular stem-cars flattish, and the rhizome not constricted at the termination of the annual shoots.

Constituents.—Probably the same as in European Solomon's seal from Polygonátum multiflórum, *Moench;* convallarin, asparagin, mucilage, sugar, etc.

Properties.—Diuretic, emetic, cathartic.

DIOSCOREA.—WILD YAM, COLIC ROOT.

Origin.—Dioscoréa villósa, *Linné.* *Natural order,* Dioscoreaceæ.

Habitat.—United States, in moist thickets.

Description.—Flattish-cylindrical, branched and curved; about 15 centimeters (6 inches) long, and 1 centimeter ($\frac{2}{5}$ inch) thick, pale brownish, hard; fracture short, somewhat fibrous; internally white with yellowish wood-bundles; inodorous; taste insipid, afterward acrid.

Constituents.—Acrid principle allied to saponin, resin, starch, sugar, ash 2–3 per cent.

Properties.—Expectorant, diaphoretic, emetic. *Dose,* 0.6 to 2 grams (gr. x–xxx.)

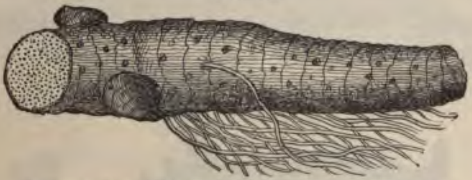
SANGUINARIA.—BLOODROOT.

Origin.—Sanguinária canadénsis, *Linné.* *Natural order,* Papaveraceæ, Eupapavereæ.

Habitat.—North America, in rich woods.

Description.—Of horizontal growth, cylindrical, about 5 centimeters (2 inches) long, 1 centimeter ($\frac{2}{5}$ inch) thick, somewhat branched, faintly annulate, wrinkled, reddish-brown; fracture short, somewhat waxy, whitish, with numerous small red dots, or of a nearly uniform brownish-red color; rootlets very brittle; odor slight; taste bitter and acrid.

FIG. 82.



Sanguinaria.—Rhizome with transverse section.

It should be collected in autumn.

Structure.—Bark thin; vascular bundles small, not woody, in one or two loose circles; pith large; rootlets with a thick bark, and rather thin central fibrovascular column; resin cells axially elongated, scattered in the parenchyme.

Constituents.—Sanguinarine, $C_{20}H_{15}NO_4$, chelerythrine, $C_{21}H_{17}NO_4$, protopine, $C_{20}H_{17}NO_5$, homochelidonine, $C_{22}H_{21}NO_4$. citric and malic acids, resins, starch, ash about 8 per cent. Sanguinarine is white, soluble in alcohol, ether, and benzol, and yields bright red salts having an acrid taste. Chelerythrine is very similar in its properties, but yields lemon-colored salts. Protopine, also present in opium, is colored deep purple by H_2SO_4. The resins yield protocatechuic acid.

Properties.—Alterative, tonic, stimulant, emetic, sternutatory. *Dose,* 0.2, 0.5, 1 to 4 grams (gr. iij, viij, xv–ʒj), in powder or tincture.

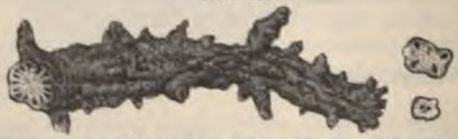
GERANIUM.—GERANIUM, CRANESBILL.

Origin—Geránium maculátum, *Linné.* *Natural order,* Geraniaceæ, Geranieæ.

Habitat.—North America, in woods and thickets.

Description.—Of horizontal growth, cylindrical, 5 to 7 centimeters (2 to 3 inches) long, 10 millimeters ($\frac{2}{5}$ inch) or less thick, tuberculated, longitudinally wrinkled, dark brown; fracture short, pale red-brown; rootlets shrivelled, very brittle; inodorous; taste astringent.

FIG. 83.



Geranium maculatum.—Rhizome and transverse section of rhizome and rootlet, natural size.

Structure.—Bark thin; wood-wedges yellowish, small, forming a circle near the cambium line; medullary rays broad; central pith large; rootlets with a thick bark and a thin central column of fibrovascular tissue.

Constituents.—Tannin 12–27 per cent. (maximum in April; blue-black with ferric salts), gallic acid (in dry rhizome), red coloring matter, starch, pectin, sugar.

Properties.—Tonic, astringent. *Dose,* 1 to 3 grams (gr. xv–xlv).

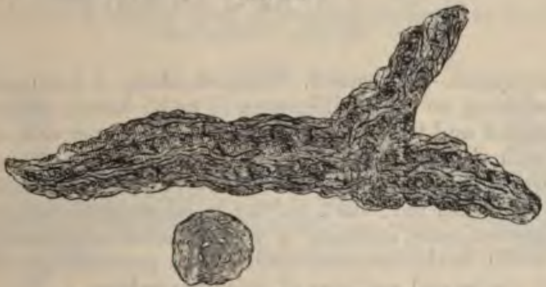
TORMENTILLA.—TORMENTIL.

Origin.— Potentílla Tormentílla, *Sibthorp* (Tormentílla eréctа, *Linné*). *Natural order,* Rosaceæ, Potentilleæ.

Habitat.—Europe, in open woodlands.

Description.—Conical, oblong, or nearly cylindrical, occasionally branched, about 5 centimeters (2 inches) long, and 15 millimeters ($\frac{3}{5}$ inch) thick, with irregular rounded elevations and ridges, depressed stem-scars, and minute scars of the filiform brittle rootlets; brown or reddish-brown; fracture smooth, slightly fibrous; internally light brownish-red; bark thin; wood-wedges small, distant, in one or in two distant circles, inclosing a large pith; inodorous, astringent. The parenchyme contains starch grains and raphides of calcium oxalate.

FIG. 84.



Tormentilla.—Rhizome and transverse section.

Constituents.—Tannin (25 per cent.), red coloring matter (tormentil red), kinovic acid, ellagic acid, starch, mucilage.

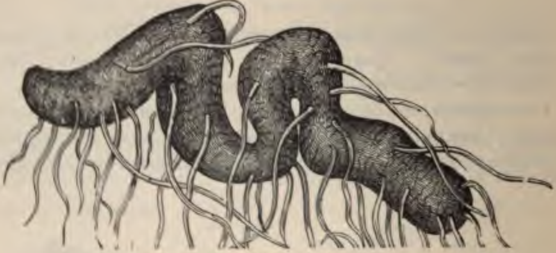
Properties.—Tonic, astringent. *Dose,* 0.6 to 2 grams (gr. x–xxx), in powder or decoction.

BISTORTA.—BISTORT.

Origin.—Poly′gonum Bistórta, *Linné. Natural order,* Polygonaceæ, Eupolygoneæ.

Habitat.—Europe, Northern Asia, Canada, and Northwestern United States, in swampy meadows.

FIG. 85.



Bistorta.—Natural size.

Description.—Depressed, S-shaped, about 5 centimeters (2 inches) long, and 15 millimeters ($\frac{3}{5}$ inch) broad, flattened or channelled and transversely striate on the upper side, convex and with depressed thin root-scars on the lower side, dark red-brown; fracture smooth, scarcely fibrous; internally light brownish-red; bark thick; wood-wedges small, numerous, approximate, inclosing a pith broader or about equal to the bark; inodorous, astringent. The parenchyme contains starch grains and raphides of calcium oxalate.

Constituents.—Tannin (20 per cent.), red coloring matter, starch.

Properties.—Tonic, astringent. *Dose,* 0.5 to 2 grams (gr. viij–xxx), in powder or decoction.

NYMPHÆA.—WATER-LILY.

Origin.—Nymphæ′a odoráta, *Aiton. Natural order,* Nymphæaceæ, Nymphææ.

Habitat.—United States, in ponds.

Description.—Of horizontal growth, about 50 centimeters (20 inches) long, and 5 centimeters (2 inches) thick, with sub-circular leaf-scars on the upper side, and with remnants of rootlets on the lower side; usually in light segments; externally brown; internally whitish or gray; wood-bundles irregular in the spongy parenchyme; inodorous; taste mucilaginous, astringent.

The rhizome of the yellow pond-lily, Núphar ádvena, *Nuttall*, is very similar.

Constituents.—Mucilage, tannin, probably alkaloids.

Properties.—Demulcent, astringent. *Dose*, 0.6 to 2 grams (gr. x–xxx).

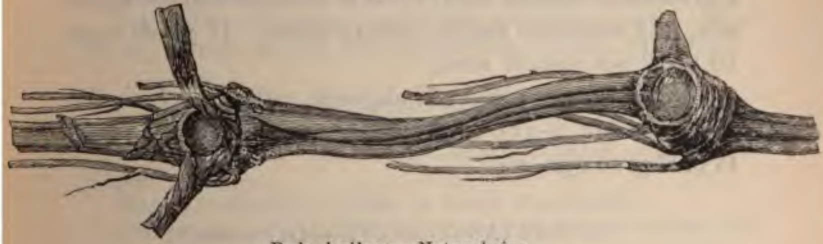
PODOPHYLLUM.—MAYAPPLE.

Origin.—Podophy′llum peltátum, *Linné. Natural order*, Berberideæ, Berbereæ.

Habitat.—North America, in rich woods and thickets.

Description.—Of horizontal growth, about 5 millimeters (⅕ inch) thick, nearly cylindrical, consisting of joints about 5 centimeters (2 inches) long, somewhat enlarged at the end, which has a circular scar on the upper side, a tuft of about ten nearly simple fragile rootlets on the lower side, and is sometimes branched laterally; smooth or somewhat wrinkled, orange-brown; fracture short; internally white and mealy; inodorous; taste sweetish, somewhat bitter and acrid.

FIG. 86.



Podophyllum.—Natural size.

Structure.—Bark thickish; wood consisting of about 16 short vascular wedges, placed in a circle and inclosing a large pith; the thin-walled parenchyme contains mainly starch, occasionally calcium oxalate.

Constituents.—Resin 4–5 per cent., starch, sugar. The resin is a mixture of several compounds, partly neutral, partly acid; both portions are partly soluble in ether; the acid yields yellow compounds with alkalies and earths.

Podophyllotoxin, $C_{23}H_{24}O_9$ (white, crystallizable, bitter, faintly acid, soluble in chloroform and acetone, slightly soluble in ether and cold benzol, sparingly soluble in water; colored cherry-red, then greenish-blue and violet by H_2SO_4), picropodophyllin (formed from podophyllotoxin by alkali; less soluble than the latter; crystalline, bitter), podophyllinic acid (inactive), podophyllo-quercetin (yellow needles, insoluble in water, slightly soluble in chloroform, more soluble in ether, freely in alcohol), green oil, and crystalline fatty acid.

Podophy'llum Emódi, *Wallich*, a Himalayan species, has a cylindrical rhizome with crowded stem-scars on the upper side, and numerous simple rootlets below. It yields from 10 to 12 per cent. of resin.

Properties.—Alterative, cholagogue, cathartic. *Dose*, 0.3 to 1 gram (gr. v–xv), in powder or extract; the resin 0.03 to 0.06 gram (gr. ss–j).

ASCLEPIAS CORNUTI.—MILKWEED.

Silkweed.

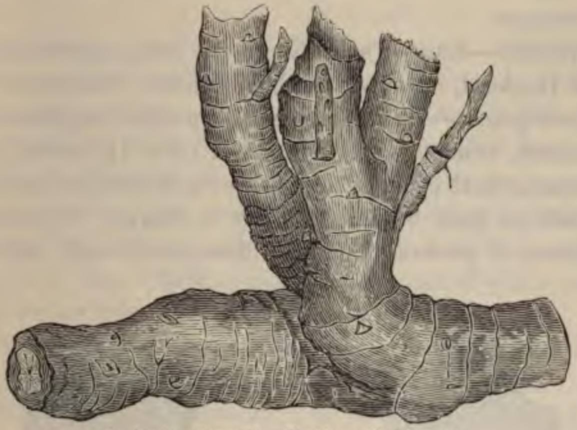
Origin.—Asclépias Cornúti, *Decaisne*, s. A. syríaca, *Linné*. *Natural order*, Asclepiadaceæ, Cynancheæ.

Habitat.—North America, fields and waste places.

Description.—Of horizontal growth, 0.5 to 2 meters (1½–6 feet) long, cut in sections, 6 to 12 millimeters (¼–½ inch) thick, cylindrical, nearly simple, finely wrinkled, somewhat knotty gray-brown, tough; fracture short or splintery, white; bark·

rather thick, with laticiferous vessels; wood-wedges yellowish, porous, narrow; nearly inodorous; taste bitterish, nauseous.

FIG. 87.



Asclepias Cornuti.—Portion of rhizome.

Constituents.—Bitter crystalline principle, asclepion (tasteless), caoutchouc (6 per cent. of milk juice), resin, tannin, starch, sugar, fat.

Properties.—Diuretic, diaphoretic, alterative, emetic. *Dose,* 0.5 to 3 grams (gr. viij–xlv), in powder, infusion, or extract.

ARALIA NUDICAULIS.—FALSE SARSAPARILLA.

Origin.—Arália nudicaúlis, *Linné.* *Natural order,* Araliaceæ, Aralieæ.

Habitat.—North America, in rocky woodlands.

Description.—Of horizontal growth, 30 centimeters (12 inches) or more long, about 5 millimeters ($\frac{1}{5}$ inch) thick, wrinkled, annulate above, stem-scars cup-shaped; rootlets few; bark light gray-brown, exfoliating; internally white with a yellowish wood and spongy pith; fracture short; odor slightly aromatic; taste mawkish.

Constituents.—Probably a little volatile oil, resin, starch, sugar, etc.

Properties.—Stimulant, diaphoretic, alterative. *Dose,* 2 to 4 grams (ʒss–j), in infusion or decoction.

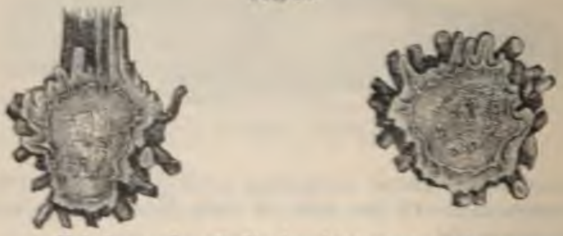
VALERIANA.—VALERIAN.

Origin.—Valeriána officinális, *Linné*. *Natural order*, Valerianeæ.

Habitat.—Europe and Northern Asia, naturalized in New England, in moist and dry localities; cultivated.

Description.—Rhizome growing upright, subglobular or obconical, from 2 to 4 centimeters ($\frac{4}{5}$ to $1\frac{1}{2}$ inches) long, truncate at both ends, yellowish-brown or brown; internally whitish or pale brownish, waxy or horny. Horizontal branches, if present, about 5 millimeters ($\frac{1}{5}$ inch) thick.

FIG. 88.



Valeriana.—Longitudinal and transverse sections.

Rootlets numerous, 5 to 10 centimeters (2 to 4 inches) long, about 2 millimeters ($\frac{1}{12}$ inch) thick, slender, brittle, brown. Odor peculiar, becoming stronger and unpleasant on keeping; taste camphoraceous and bitter.

Collected from dry localities, the rhizome is small, and has few light brown rootlets; from moist localities, it is larger, usually cut longitudinally, has numerous, larger, and darker rootlets, shows at the lower end scars from decayed roots, and contains less volatile oil.

Structure.—Bark rather thin, covered with a thin cork; nucleus sheath mostly indistinct; fibrovascular bundles small, forming a circle and inclosing a thick pith; the branches have a similar structure but a thick bark. The rootlets have a thick bark, and a slender central vascular cord with a meagre pith and inclosed in a nucleus-sheath. The parenchyme contains starch, extractive matter, or oil drops.

Constituents.—Volatile oil ½–2 per cent.; valerianic, formic, acetic, and malic acids, chatinine (isolated in 1891), tannin, resin, starch, mucilage, sugar. The volatile oil has the density 0.94, and consists of the alcohol borneol, $C_{10}H_{18}O$, its ether, $(C_{10}H_{17})_2O$, and its formic, acetic, and valerianic ethers; the acids are liberated by the gradual decomposition of the compound ethers. Valerianic acid, $C_5H_{10}O_2$, is oily, volatile, soluble in 30 parts of water, and has a peculiar odor; the salts have a sweet taste.

Properties.—Stimulant, anodyne, antispasmodic, nervine. *Dose*, 1 to 6 grams (gr. xv–ʒjss), in infusion, tincture, or fluid extract. The volatile oil, 0.06 to 0.2 gram (gr. j–iij).

ARNICÆ RADIX.—Arnica Root.

Origin.—A′rnica montána, *Linné*. *Natural order*, Compositæ, Senecionideæ.

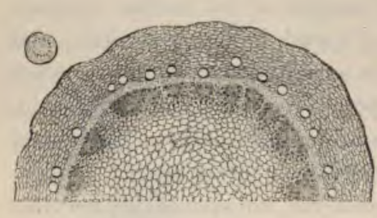
Habitat.—Europe, Northern Asia, Northwestern America, in mountainous localities.

Description.—Of oblique growth, about 5 centimeters (2 inches) long and 2 to 3 millimeters ($\frac{1}{12}$–$\frac{1}{8}$ inch) thick, brown, sharply wrinkled longitudinally, rough and irregularly annulate from remnants of leaves and stem bases; fracture short, internally whitish. Rootlets thin, about 10 centimeters (4 inches) long, light-brown, fragile. Odor slightly aromatic; taste aromatic, pungent, bitter.

Structure.—Bark thickish, with a thin layer of cork, and near the cambium a circle of resin cells; wood-wedges short, forming a close circle, and inclosing a large pith. The rootlets have a thick bark, a slender central fibrovascular cord, and surrounding the latter a circle of few resin cells.

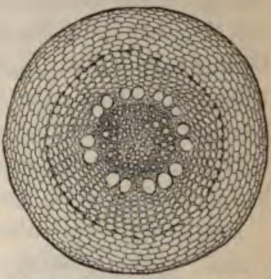
The rhizome of strawberry, Fragária vésca, *Linné*, has a similar appearance, but is harder, darker brown, not annulate, and contains starch, but no resin cells.

FIG. 89.



Arnica.—Transverse section of rhizome, natural size, and magnified 12 diam.

FIG 90.



Section of rootlet, magnified 25 diam.

Constituents.—Volatile oil $\frac{1}{2}$–1 per cent., acrid and tasteless resins, arnicin, capronic and caprylic acids, inulin 10 per cent., tannin, mucilage. Arnicin is yellow, amorphous, acrid, freely soluble in alcohol and ether, slightly soluble in water.

Properties. — Irritant, stimulant, diuretic, vulnerary. *Dose*, 0.3 to 2 grams (gr. v–xxx), in powder or infusion.

SERPENTARIA.—SERPENTARIA.

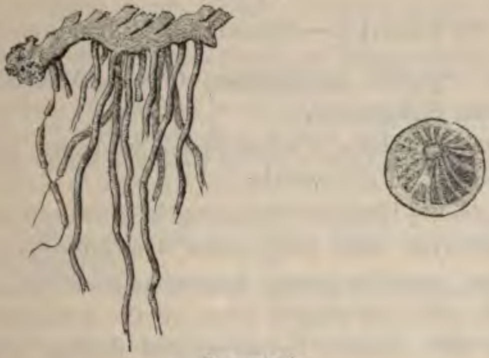
Origin.—1. Aristolóchia Serpentária, *Linné*, and, 2. Aristolóchia reticuláta, *Nuttall*. *Natural order*, Aristolochiaceæ.

Habitat.—United States, in hilly woods. No. 1, east of the Mississippi; No. 2, in the Southwestern States.

Description.—Rhizome about 25 millimeters (1 inch) long and 3 millimeters ($\frac{1}{8}$ inch) thick, bent, on the upper side with approximate short stem-remnants, on the lower side with numerous thin branching rootlets about 10 centimeters (4 inches) long; dull yellowish-brown, internally whitish; odor aromatic, camphoraceous; taste warm, bitterish, and camphoraceous.

The rootlets of Ar. reticulata (Red River or Texas snakeroot) are coarser, longer, and less interlaced than those of Ar. Serpentaria (Virginia snakeroot).

FIG. 91.



Serpentaria.

Rhizome with rootlets. Transverse section of rhizome.

Structure.—Bark thin; wood-wedges longest on lower side of rhizome, separated by broad medullary rays; pith large-celled. Rootlets with a thick bark and a thin central fibrovascular cord. The parenchyme contains starch and, in scattered cells, oil.

Constituents.—Volatile oil ½–1 per cent. (contains terpene and mainly $C_{15}H_{25}O_2$, an ether of borneol), aristolochine, little tannin, starch, sugar, mucilage, albumin, resin; ash 11 per cent. Aristolochine forms light yellow needles, is very bitter, soluble in most simple solvents. (Ferguson, 1887.)

Properties.—Stimulant, diaphoretic, tonic. *Dose,* 0.3 to 2 grams (gr. v–xxx), in powder, infusion, tincture, or fluid extract.

Admixtures.—The subterraneous parts of Panax, Cypripedium, Hydrastis, and others are readily distinguished; Spigelia has no projecting stem-remnants, and in the wood indistinct medullary rays. The rhizome and rootlets of Polemónium réptans, *Linné,* resemble serpentaria in size and shape, but are nearly white.

SPIGELIA.—SPIGELIA. PINKROOT.

Origin.—Spigélia marilándica, *Linné. Natural order,* Loganiaceæ, Euloganieæ.

Habitat.—Southern United States, westward to Texas and Wisconsin, in rich woods.

Description.—Rhizome horizontal in growth, 5 centimeters (2 inches) or more long, about 3 millimeters ($\frac{1}{8}$ inch) thick, bent, purplish-brown, somewhat branched, on the upper side with cup-shaped scars, on the lower side with numerous thin, brittle, lighter-colored rootlets about 10 centimeters (4 inches) long; fracture smooth; somewhat aromatic, sweetish, and bitter.

Structure.—Bark thin; wood-circle whitish, thickest on lower side, scarcely radiate; pith usually dark colored or decayed. Rootlets with a thick bark and a slender central fibrovascular cord.

It should not be confounded with the rhizome of Phlox Carolina, *Linné* (like Spigelia, known as Carolina pink), which is short, upright, and has a central pith, hard wood, and brownish-yellow, rather coarse, straight rootlets containing a straw-colored wood underneath a readily removable bark; benzin extracts from it a crystalline white tasteless hydrocarbon (1 per cent.), with some fat, wax, and red color.

Constituents.—Little volatile oil, resins, bitter principle (insoluble in ether), tannin, wax, fat, gum, spigeline (volatile alkaloid).

Properties.—Anthelmintic, toxic, dilates the pupil. *Dose*, 1 to 4 grams (gr. xv–ʒj).

GEUM RIVALE.—Water Avens.

Origin.—Géum rivále, *Linné.* *Natural order*, Rosaceæ, Potentilleæ.

Habitat.—North America (south to Pennsylvania), Northern Asia, Northern and Central Europe.

Description.—Horizontal or oblique in growth, about 5 to 7 centimeters (2 to 3 inches) long and 6 millimeters (¼ inch) thick, tuberculate and scaly above, wrinkled; fracture short, waxy, reddish or brownish, with a thin bark, small and distant whitish wood-wedges, and a large pith. Rootlets wrinkled, with a thick bark. Odor faintly aromatic; taste astringent, bitterish.

Constituents.—Little volatile oil, tannin, bitter principle, sugar, resin, etc.

Properties.—Astringent, tonic. *Dose*, 1 to 3 grams (gr. xv–xlv), in powder or decoction.

GEUM URBANUM.—Avens.

Radix caryophyllatæ.

Origin.—Géum urbánum, *Linné.* *Natural order*, Rosaceæ, Potentilleæ.

Habitat.—Europe, in shady places.

Description.—Upright or oblique, 3 to 5 centimeters (1 to 2 inches) long, obconical, thinner and abrupt below, tuberculate and scaly, dark brown, hard; upon transverse section waxy, light purplish-brown; bark thin; wood-circle yellowish, narrow; pith large. Rootlets light brown, with a thickish bark. Odor aromatic, clove-like; taste astringent, somewhat aromatic, and bitter.

Constituents.—Little volatile oil, tannin 30 per cent., bitter principle, resin, etc.

Properties.—Astringent, tonic. *Dose*, 1 to 3 grams (gr. xv–xlv), in powder or decoction.

ASCLEPIAS INCARNATA.—SWAMP MILKWEED.

Flesh-colored Asclepias.

Origin.—Asclépias incarnáta, *Linné*. *Natural order*, Asclepiadeæ, Cynancheæ.

Habitat.—North America, wet grounds.

Description.—Of upright or oblique growth, about 2 centimeters (⅘ inch) long, irregularly globular or oblong, knotty, yellowish-brown, hard, with a thin bark, tough whitish wood, and rather thick central pith or hollow. Rootlets 10 centimeters (4 inches) or more long, light brown, with the white bark and woody cord of about equal thickness. Inodorous; taste sweetish, acrid, and bitter.

Constituents.—Volatile oil a trace, two acrid resins, asclepiadin (yellow amorphous glucoside, emetic, easily decomposed), alkaloid, pectin, starch, sugar, etc.; ash 8.25 per cent.

Properties.—Alterative, emetic, cathartic. *Dose*, 1 to 3 grams (gr. xv–xlv), in decoction.

HYDRASTIS.—HYDRASTIS. GOLDEN SEAL.

Origin.—Hydrástis canadénsis, *Linné*. *Natural order*, Ranunculaceæ, Helleboreæ.

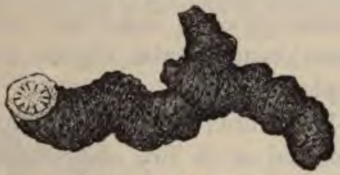
Habitat.—North America, west to Missouri and Arkansas, in woodlands.

Description.—Obconical and upright, or of oblique growth and sub-cylindrical, about 4 centimeters (1½ inches) long and 6 millimeters (¼ inch) thick, with short branches terminating in cup-shaped scars, somewhat annulate, and longitudinally wrinkled; externally brownish-gray; fracture short, waxy, bright reddish-yellow; rootlets thin, brittle, about 12 centimeters (5 inches) long; odor slight; taste bitter.

Structure.—Bark thickish, yellow or orange-colored. Wood-wedges about 10, narrow, light yellow. The yellow broad medullary rays and large pith like the bark contain starch. Rootlets with a thick yellow bark and thin subquadrangular woody cord, surrounded by a nucleus sheath, and enclosing a meagre pith.

Constituents.—Berberine, $C_{20}H_{17}NO_4$, 3–4 per cent., hydrastine, $C_{21}H_{21}NO_6$, canadine, $C_{21}H_{21}NO_4$, resin, fluorescent compound, starch, sugar, etc. Berberine dissolves in alcohol and in water, slightly in benzol, and is insoluble in ether, chloroform, and petroleum benzin; its salts are bright yellow, and sparingly soluble in acidulated water; the hot alcoholic solution yields with iodine not in excess dark green lustrous scales. Hydrastine is soluble in alcohol, ether, benzol, and most soluble in chloroform; its salts are white and bitter; on oxidation with MnO_2, yields opianic and finally hemipinic acid and hydrastinine; on dry distillation trimethylamine and meconin. Canadine forms white needles, the sulphate only easily soluble in water and alcohol; in alcoholic solution yields with iodine yellow crystals.

FIG. 92.



Hydrastis.—Rhizome with transverse section.

Properties.—Tonic, deobstruent, alterative. *Dose*, 0.3 to 3 grams (gr. v–xlv), in decoction or fluid extract.

CAULOPHYLLUM.—BLUE COHOSH, PAPOOSE ROOT, SQUAW ROOT.

Origin.—Caulophy'llum (Leóntice, *Linné*) thalictroídes, *Michaux*. *Natural order*, Berberideæ, Berbereæ.

Habitat.—North America, southward to Kentucky, in rich woodlands.

Description.—Of horizontal growth, matted, about 10 centimeters (4 inches) long, 6 or 8 millimeters ($\frac{1}{4}$–$\frac{1}{3}$ inch) thick, and with the branches 4 or 5 centimeters ($1\frac{1}{2}$–2 inches) broad, bent, knotty, with numerous broad concave stem-scars, dark gray-brown, hard, fracture rather short; internally whitish. Rootlets very numerous, densely matted, about 13 centimeters (5 inches) long, and about 1 or 1.5 millimeters ($\frac{1}{25}$ or $\frac{1}{16}$ inch) thick, wiry and tough. Nearly inodorous; taste sweetish, slightly bitter, and somewhat acrid, unpleasant.

Structure.—Bark thin; wood-wedges narrow or linear, numerous, elongated or in two circles in the rhizome, in the branches shorter, more uniform, and in a single narrow circle; medullary rays rather broad; pith large. Rootlets with a relatively thicker bark, and a rather thick central woody cord. The parenchyme contains starch.

Admixture.—Hydrastis differs in shape and color.

Constituents.—Leontin (white, feathery, soluble in boiling alcohol and ether, acrid, sternutatory; glucoside), resins, tannin, wax.

Properties. — Antispasmodic, diuretic, emmenagogue. *Dose,* 1 to 2 grams (gr. xv–xxx).

COLLINSONIA.—Stoneroot.

Origin.—Collinsónia canadénsis, *Linné.* *Natural order,* Labiatæ, Satureineæ.

Habitat.—North America, in woodlands.

Description.—Of horizontal growth, about 10 centimeters (4 inches) long, and with the very knotty, short, and irregular branches nearly as broad; stem-scars numerous, shallow; externally brown-gray, very hard; internally whitish or grayish; bark very thin; wood-wedges irregular; rootlets numerous, rather brittle; nearly inodorous; taste bitterish, nauseous.

Constituents.—Resinous matter, etc.
Properties.—Diuretic, irritant.

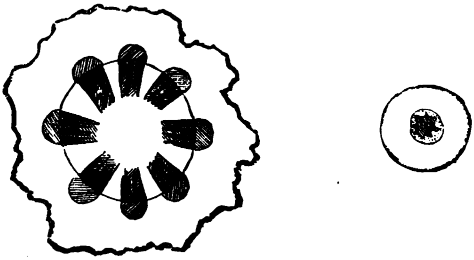
HELLEBORUS.—BLACK HELLEBORE.

Origin.—Hellébborus níger, *Linné.* *Natural order*, Ranunculaceæ, Helleboreæ.

Habitat.—Central and Southern Europe.

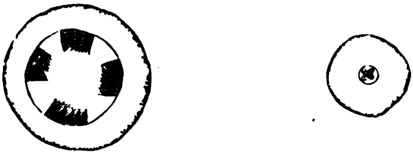
Description.—Of upright growth, irregular knotty, about 5 centimeters (2 inches) long and 1 centimeter ($\frac{2}{5}$ inch) thick, with short, somewhat annulate branches; externally brown-black; internally grayish, with a thick bark, a circle of about 8 wood-wedges, broad medullary rays, and a large pith Rootlets long, brown-black, very brittle, with a thick bark and a hexagonal wood-centre. Odor slight, heavy (in the fresh state radish-like); taste sweetish, bitterish, and acrid.

FIG. 93.



Helleborus niger.—Transverse section of rhizome and root, magnified 3 diam.

FIG. 94.



Helleborus virdis.—Transverse section of rhizome and root, magnified 3 diam.

Hellébborus víridis, *Linné*, Green hellebore. The rhizome resembles the preceding, but is of smaller dimensions, and the narrow wood-wedges form three or four groups, separated by broad medullary rays; the woody cord of the rootlets has about 4 obtuse rays. It contains more helleborin, and is considered to be more active than black hellebore.

Constituents. — Helleborin, $C_{36}H_{42}O_6$, and helleborein, $C_{26}H_{44}O_{15}$, both poisonous; resin, fat, starch, no tannin. Helleborein predominates, is precipitated by tannin, soluble in water, also in alcohol, not in ether; yields with acids sugar and inert helleboretin. Helleborin is scarcely soluble in ether and cold water, easily soluble in chloroform and hot alcohol; with acids yields sugar and helleboresin.

Properties.—Diuretic, emmenagogue, cathartic. *Dose*, 0.3 to 1.3 grams (gr. v–xx), in powder, tincture, or extract.

Admixtures.—Actæ'a álba, *Linné*, The rhizome with rootlets has the dimensions of black hellebore, but closely resembles black snakeroot in appearance and structure, and contains tannin.

CIMICIFUGA.—Black Snakeroot.

Origin.—Cimicífuga racemósa, *Nuttall.* *Natural order*, Ranunculaceæ, Helleboreæ.

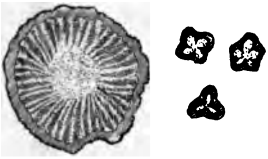
Habitat.—North America, in rich woodlands, westward to Eastern Kansas.

Description.—Of horizontal growth, 5 to 15 centimeters (2–6 inches) long, about 2 centimeters ($\frac{4}{5}$ inch) thick, hard, with numerous stout, upright or curved branches, terminated by a cup-shaped scar; brownish-black, hard; fracture smoothish; internally whitish. Rootlets numerous, wiry, brittle, obtusely quadrangular, about 2 millimeters ($\frac{1}{12}$ inch) thick; fracture short. Nearly inodorous; taste bitter and acrid.

Structure.—Bark of rhizome thin and firm; wood-wedges elongated, narrow or linear, most uniform in the branches; medullary rays of about the same width; central pith rather large. Rootlets with a thick bark and a ligneous cord branching into about four broad rays, and enclosed in a nucleus sheath.

Constituents.—Crystalline principle (alkaloid ?), not precipitated by lead acetate, soluble in chloroform and alcohol, the solution intensely acrid; resins, fat, wax, tannin, starch, gum, sugar. The crystalline principle has not been obtained by recent investigators. A glucoside is probably present.

Fig. 95.



Cimicifuga.—Transverse section through a branch of the rhizome and through rootlets, natural size.

Properties.—Alterative, emmenagogue, sedative. *Dose,* 0.3 to 2 grams (gr. v–xxx), in powder, decoction, or fluid extract.

GILLENIA.—Gillenia. American Ipecac.

Origin.—1. Gillénia stipulácea, *Nuttall,* and, 2. Gillénia trifoliáta, *Moench. Natural order,* Rosaceæ, Spiræeæ.

Habitat.—United States: No. 1, Western and Southern States; No. 2, east of the Alleghanies.

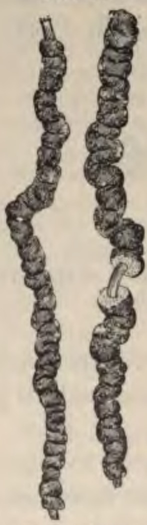
Description.—Of horizontal growth, very knotty, much branched, 10 to 25 millimeters (⅖–1 inch) thick, with a thin bark, and numerous tortuous or undulated, annulate and somewhat transversely fissured rootlets having a thick irregular bark, which is brittle, composed of two reddish layers and marked with numerous minute resinous dots; wood tough, whitish, with fine medullary rays, and in the rhizome with a thin pith; nearly inodorous, taste bitter.

The rhizome of Gillenia trifoliata is smaller and less knotty; the rootlets smoother and less distinctly annulate.

Constituents.—Gillenin, resin, tannin, starch, etc. Gillenin is a whitish powder, bitter, neutral, soluble in water, alcohol, and ether, and colored blood-red by nitric acid.

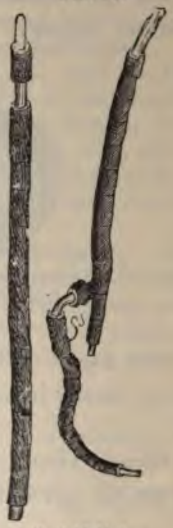
Properties.—Mild emetic. *Dose,* 1 to 2 grams (gr. xv–xxx).

Fig. 96.



G. stipulacea.

Fig. 97.



G. trifoliata.

Rootlets, natural size.

TRIOSTEUM.—FEVERROOT. BASTARD IPECAC.

Origin.—Trióstеum perfoliátum, *Linné. Natural order,* Caprifoliaceæ, Lonicereæ.

Habitat.—United States, in woodlands.

Description.—Of horizontal growth, 15 centimeters (6 inches) or more long, about 15 millimeters ($\frac{3}{8}$ inch) thick, knotty-cylindrical, with broad cup-shaped stem-scars, yellowish-brown, bark thin, wood hard, whitish, with fine medullary rays. Rootlets long, about 5 millimeters ($\frac{1}{5}$ inch) thick, with a thick wrinkled bark. Inodorous; taste bitter, somewhat nauseous.

Constituents.—No analysis.

Properties.—Purgative, emetic. *Dose,* 1 to 2 grams (gr. xv–xxx).

ARALIA RACEMOSA.—AMERICAN SPIKENARD.

Origin.—Arália racemósa, *Linné. Natural order,* Araliaceæ, Aralieæ.

Habitat.—North America, in rich woods.

Description.—Grows obliquely, 10 or 15 centimeters (4 or 6 inches) long with prominent concave stem-scars about 3 centimeters (1⅕ inches) broad, pale brown, internally whitish. Roots numerous, long, about 25 millimeters (1 inch) thick at the base, little branched, wrinkled, pale brown, breaking with a short fracture, internally whitish; of a peculiar aromatic odor and taste.

Constituents.—Probably volatile oil, resin, starch, sugar, etc.

Properties.—Stimulant, diaphoretic, alterative, expectorant. *Dose*, 2 to 4 grams (ʒss–j), in infusion.

ASARUM.—Wild Ginger.

Origin.—A′sarum canadénse, *Linné.* *Natural order*, Aristolochiaceæ.

Habitat.—North America to North Carolina, in rich woodlands.

Description.—Of horizontal growth, 10 centimeters (4 inches) or more long, and 3 millimeters (⅛ inch) thick, irregular quadrangular or almost two-edged, finely wrinkled, grayish-brown or purplish-brown, internally whitish, fracture short; rootlets thin, nearly simple, on the nodes, which are about 12 millimeters (½ inch) distant; aromatic, pungent, and bitterish.

Structure.—Bark rather thick; cambium layer prominent; wood-wedges short and distant; central pith large. The parenchyme contains starch and occasionally oleoresin or oil, the latter principally in the bark. Rootlets with a thick bark and a thickish ligneous cord.

Constituents.—Volatile oil, 1.5–3.5 per cent., resin, coloring matter (asarin), starch, mucilage, sugar, possibly an alkaloid; ash about 13 per cent. The volatile oil is of spec. grav. 0.953, very aromatic, and consists of asarene $C_{10}H_{16}$, a neutral body $C_{12}H_{16}O_2$, asarol $C_{10}H_{18}O$, and the acetic and probably also the valerianic ether of asarol; probably also methyl-eugenol.

Properties.—Carminative, stimulant, diaphoretic. *Dose,* 2 grams (ʒss) in infusion.

Allied drug.—A′sarum europæ′um, *Linné.* Asarabacca. The rhizome is 1 or 2 millimeters ($\frac{1}{25}$–$\frac{1}{12}$ inch) thick, nearly quadrangular, and is emetic, cathartic, and employed as an errhine. The volatile oil contains asarene, methyl-eugenol, and asarone (crystalline, emetic), but no asarol.

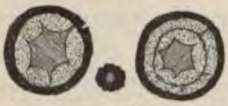
LEPTANDRA.—Leptandra. Culver's Physic.

Origin.—Verónica (Leptándra, *Nuttall*) virgínica, *Linné.* *Natural order,* Scrophularineæ, Digitaleæ.

Habitat.—United States, south to Georgia, and west to Minnesota, in low grounds.

Description.—Horizontal, 10 to 15 centimeters (4 to 6 inches) long, about 10 millimeters ($\frac{2}{5}$ inch) thick, somewhat flattened, bent, and branched, deep blackish-blown, on upper side with cup-shaped scars, hard, of a woody fracture, internally blackish with a broad yellowish circle of wood; rootlets thin, wrinkled, very fragile; inodorous; taste bitter and feebly acrid.

Fig. 98.



Leptandra.—Transverse sections of rhizome and rootlets, natural size.

Structure.—Bark thin, blackish-gray; wood tough, yellowish in one or two circles; pith large, purplish-brown, often partly destroyed, about six-rayed from the medullary rays. Rootlets with a thick bark and a slender ligneous cord.

Constituents.—Leptandrin, resin 6 per cent., saponin, tannin, mannit, gum, and possibly a volatile alkaloid. Leptandrin is crystalline, bitter, soluble in water, alcohol, and ether, not precipitated by lead subacetate. Leptandrin of the eclectics is essentially the alcoholic extract.

Properties.—Alterative, cholagogue, cathartic. *Dose*, 1 to 4 grams (gr. xv–ʒj), in powder and extract.

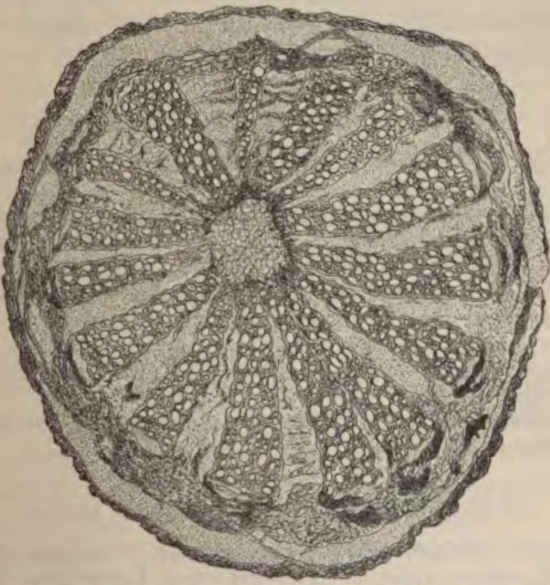
MENISPERMUM.—Yellow Parilla.

Origin. —Menispérmum canadénse, *Linné.* *Natural order*, Menispermaceæ, Cocculeæ.

Habitat.—North America, in moist thickets.

Description.—Cylindrical, 1 meter (40 inches) or more long, about 6 millimeters ($\frac{1}{4}$ inch) thick, somewhat knotty from scars of overground stems, with indistinct nodes, finely wrinkled longitudinally, and beset with numerous thin branching and rather brittle rootlets, externally yel-

Fig. 99.



Menispermum canadense.—Transverse section of rhizome, magnified.

lowish-brown; fracture tough, woody; internally yellowish; nearly inodorous; taste bitter.

Structure.—Bark thickish with semilunar bast bundles; wood-wedges about 14, broad, porous, separated by rather broad medullary rays, those on the lower side longest; central pith nearly equalling the shortest wood-wedges. The parenchyme contains starch. The overground stem, which is often present, has a large spongy central pith, and short, almost square, wood-wedges.

Constituents.—Berberine, menispine, starch, resin, tannin. Menispine is white, insoluble in benzol and alkalies, and becomes brown by H_2SO_4 and brownish-yellow by $ZnCl_2$.

Properties.—Tonic, alterative, diuretic. *Dose*, 1 to 4 grams (gr. xv–ʒj).

XANTHORRHIZA.—YELLOW ROOT.

Origin.—Xanthorrhíza apiifólia, *L'Heritier*. *Natural order*, Ranunculaceæ, Helleboreæ.

Habitat.—Southern and Central United States.

Description.—Horizontal, 0.5 to 1 meter (20 to 40 inches) long, 1 centimeter (⅖ inch) thick, bent, much branched, sparingly beset with brittle fibres, externally light yellowish-brown; bark thin, internally deep yellow, covering a bright yellow tough wood, with a thin pith; inodorous, bitter.

Constituents.—Berberine, a white alkaloid, starch, sugar, mucilage, resin, etc. Ash about 2 per cent.

Properties.—Tonic. *Dose*, 2 to 4 grams (ʒss–j) in powder or infusion.

BERBERIS AQUIFOLIUM.—OREGON GRAPE.

Origin.—Bérberis aquifólium, *Pursh*; B. nervosa, *Pursh*; and B. repens, *Lindley*. *Natural order*, Berberideæ, Berbereæ.

Habitat.—Rocky Mountains and westward.

Description.—In more or less knotty and tough pieces, varying from 3 to 25 or 50 millimeters (⅛ to 1 or 2 inches) in thickness, with a thin, yellowish-brown, internally bright yellow bark, and a yellow hard wood with fine medullary rays, the rhizome with a thin pith; inodorous and bitter. The rhizomes and roots of B. repens and B. nervosa rarely exceed millimeters (⅛ inch) in diameter.

Constituents.—Berberine, oxyacanthine, berbamine, phytosterin, sugar, gum, etc. See Barberry Bark.

Properties.—Tonic, alterative. *Dose,* 0.5 to 2 grams (gr. viij–ʒss), in decoction or fluid extract.

3. TUBERS AND BULBS.—TUBERA ET BULBI.

Tubers are enlarged, more or less fleshy subterraneous stems or branches, or dilated bases of stems, which are not invested with leaves. They consist of either one internode or of several, and hence may develop either a terminal or several lateral buds. The tuberous roots of jalap and aconite carry upon the apex small portions or scars of the stem. The dilated fleshy tuberous base of an annual stem is often designated as a *corm.*

Bulbs are buds with a permanently short, fleshy axis, which is invested with fleshy leaves, called scales, the external layers of the latter usually decaying and becoming dry and papyraceous. The *scaly* bulb has the leaves rather short, thick, and imbricate; in the *tunicated* bulb the leaves are broad, cover the axis and inner leaves completely, or nearly so, and thus form concentric layers. If several small bulbs surround a common axis, and the whole is again invested with fleshy or dry leaves, the *compound* bulb is produced. Bulbous plants are monocotyledons.

Histology.—The arrangement of the tissue in the tubers corresponds with that of the rhizome, while the scales of the bulbs have, like the leaves proper, more or less delicate fibrovascular tissue (veins) imbedded in soft and fleshy parenchyme.

Classification.

TUBERS.—*Sect.* 1. Of Dicotyledons.	
With resin cells in circles.	Jalapa.
Without resin cells; turnip-shaped, very acrid.	Aconitum.
Subglobose, yellowish, bitterish.	Corydalis.
Sect. 2. Of Monocotyledons.	
Ovate with a lateral groove; usually in reniform sections, bitter.	Colchicum.
Depressed globose, above with a zone of rootlets or their scars; acrid.	Arum.
Ovate or roundish; horny; mucilaginous.	Salep.
BULBS, all tunicated.	
Single; globular ovate; mostly in sections of the scales; mucilaginous, bitter, acrid.	Scilla.
Compound; mucilaginous, pungent, acrid.	Allium.

JALAPA.—JALAP.

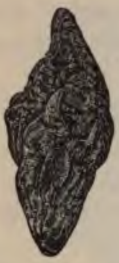
Origin. — Ipomœ′a (Ipomæ′a; Exogónium, *Bentham*) Púrga, *Hayne*. *Natural order*, Convolvulaceæ, Convolvuleæ.

Habitat.—Eastern Mexico.

Description.—Jalap tubers are produced from the nodes of the thin rhizomes by the enlargement of the bases of the rootlets, and are either napiform, and 5 to 10 centimeters (2–4 inches) thick, or pyriform or oblong, and thinner, but varying in size; the larger ones incised, more or less wrinkled, bark brown, with lighter-colored warts and short transverse ridges, hard, compact, internally pale grayish-brown, scarcely radiate, but showing numerous concentric circles; fracture resinous, not fibrous; odor slightly smoky and sweetish; taste sweetish and acrid.

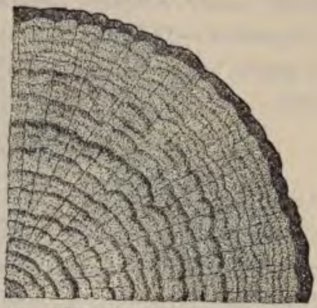
Structure. — The predominating tissue is parenchyme, containing starch (which in the outer layers is pasty) and calcium oxalate. Bark thin, in the inner layer with a dense zone of resin cells. Vascular bundles small, distant, and indistinct; the concentric circles formed of resin cells, arranged in wavy, narrow, or somewhat broader zones.

Fig. 100.



Jalap tuber, small.

Fig. 101.



Jalap.—Transverse section, natural size.

Quality.—10 grams of jalap should yield not less than 1.2 grams (or 12 grains for 100 grains of jalap) of resin, not more than 10 per cent. of which should be soluble in ether.

Constituents.—Starch, gum, sugar, etc., resin 7 to 15 or 22 per cent.; about $\frac{1}{10}$ of the resin (soft, waxy matter?) is soluble in ether, also in potassa, and reprecipitated by acids; the remainder is the glucoside jalapurgin (convolvulin), $C_{62}H_{100}O_{32}$, which is soluble in alkalies and converted into jalapurgic (convolvulic) acid, soluble in water.

False Jalaps.—Tampico jalap, from Ipomœ′a símulans, *Hanbury*. Irregularly globular, or elongated, deeply wrinkled, without transverse ridges or scars, yields 10 to 15 per cent. resin (tampicin), almost wholly soluble in ether.

Fusiform (male or light) jalap, jalap stalks; from Ipomœ′a orizabénsis, *Ledanois*. Spindle-shaped, but mostly divided longitudinally and transversely, in sections or rectangular irregular and rather woody pieces; the transverse section distinctly radiate from thick porous wood-bundles.

The resin, orizabin (jalapin), $C_{34}H_{56}O_{16}$, is completely soluble in ether.

Mechoacanna root, from Convólvulus Mechoacánna, *Vandelli*, and perhaps from other plants; in sections, light, whitish, mealy, contains little resin.

Properties.—Diuretic, hydragogue cathartic. *Dose*, 0.5 to 2 grams (gr. viij–ʒss); of the resin 0.1 to 0.2 gram (gr. jss–iij).

ACONITI RADIX.—Aconite Root.

Aconitum, *U. S. P.*

Origin.—Aconítum Napéllus, *Linné*. *Natural order*, Ranunculaceæ, Helleboreæ.

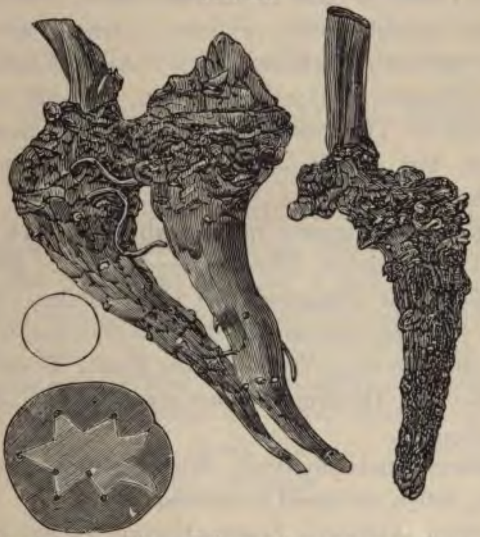
Habitat.—Mountainous districts of Europe, Asia, and Northwestern North America.

Characters.—Produced at the end of short horizontal rhizomes; 15 to 20 millimeters ($\frac{3}{5}$–$\frac{4}{5}$ inch) thick at the crown, conically contracted below, about 5 centimeters (2 inches) long, with scars or fragments of rootlets, externally dark brown, wrinkled; fracture short, amylaceous, or horny; internally whitish or brownish; odor none (the fresh tuber radish-like); taste sweetish, soon acrid, producing a sensation of tingling.

Structure.—Bark thick; the inner layer composed of small cells, and separated from the outer layer by a nucleus sheath. Cambium about seven-rayed. Vascular bundles small, located at the termination, and at the base of the rays. Pith large-celled. The parenchyme contains starch.

Constituents.—Resin, fat, sugar, aconitic acid, $H_3C_6H_3O_6$, and about 0.07 per cent., of alkaloids, consisting of aconitine (benzoylaconine), $C_{33}H_{43}NO_{12}$, pseudaconitine (veratroylaconine), $C_{36}H_{49}NO_{11}$, aconine, $C_{26}H_{39}NO_{11}$, pseudaconine, $C_{27}H_{41}NO_8$, picraconitine, $C_{31}H_{45}NO_{10}$. These alkaloids and one or two amorphous bases are contained in commercial aconitine. By heating in sealed tubes aconitine is decomposed into benzoic acid and aconine, and pseudaconitine into dimethyl-protocatechuic (veratric) acid and pseudaconine.

FIG. 102.



Aconitum Napellus.—Tubers and transverse section.

Properties.—Anodyne, sedative, poisonous. *Dose,* 0.06 to 0.12 gram (gr. j–ij), in tincture. Commercial aconitine, being of variable composition, is not adapted for internal use.

Antidotes.—Emetic (mustard, ipecacuanha, zinc sulphate, apomorphine); friction of extremities; amyl nitrite inhalation; atropine; digitalis.

Other Aconite Roots.—Aconítum Cammárum, *Jacquin,* Europe; globular-ovate, about 15 millimeters ($\frac{3}{5}$ inch) long, the rays of the pith about five in number, rather short and rounded.

Aconítum Stœrkeánum, *Reichenbach,* Europe; slender conical, the pith roundish pentagonal. The tubers of this and the preceding species are sometimes found among commercial aconite root, and possess similar properties.

Aconítum fĕrox, *Wallich.* Bikh or bish, Indian aconite. From 5 to 10 centimeters (2 to 4 inches) long, and 25 millimeters (1 inch) or more in diameter above, conical, brown, internally whitish, mealy or horny, intensely acrid. The roots of the Ac. uncinátum, *Linné;* Ac. lúridum, *Hooker filius et Thomsen*, and perhaps others, are said to be collected with it. The constituents are similar to those of Ac. Napellus, but pseudaconitine predominates among the alkaloids.

Japanese and Chinese aconite, obtained from Ac. Físcheri, *Reich*, Ac. japónicum, *Thunberg*, and others. The tubers are napiform or elongated, the pith circular, elliptic, or more or less five- to seven-rayed. Allied to the first species is Ac. columbiánum, *Nuttall*, of the Rocky Mountains and Sierra Nevada. The drug contains japaconitine, $C_{66}H_{88}N_2O_{21}$; very poisonous.

Aconítum heterophy′llum, *Wallich*, India; conical or fusiform, bitter, not acrid or poisonous.

Aconítum Anthóra, *Linné*, Europe; long, fusiform; pith thin, with short and longer rays.

Aconítum Lycóctonum, *Linné*, Europe and Northern Asia; oblique, several-headed rhizome with elongated conical rootlets, bitter.

CORYDALIS.—TURKEY CORN, SQUIRREL CORN.

Origin.—Dicéntra canadénsis, *De Candolle*, s. Cory′dalis canadénsis, *Goldie*. *Natural order*, Papaveraceæ, Fumarieæ.

Habitat.—Canada and mountains of United States, south to Kentucky.

Description.—Depressed globose, about 6 millimeters (¼ inch) thick, with a scar on each of the depressed sides, somewhat wrinkled, otherwise smooth; tawny-yellow, internally whitish or yellowish, fracture horny or rather mealy, inodorous, bitter.

The rhizome of Dicéntra exímia, *De Candolle*, s. Cory′dalis formósa, *Pursh*, is scaly.

Constituents.—Acrid and tasteless resin, starch, mucilage, fumaric acid, and corydaline, which is very bitter in solution.

Properties.—Tonic, diuretic, alterative. *Dose*, 0.6 to 2 grams (gr. x–xxx), in powder or extract.

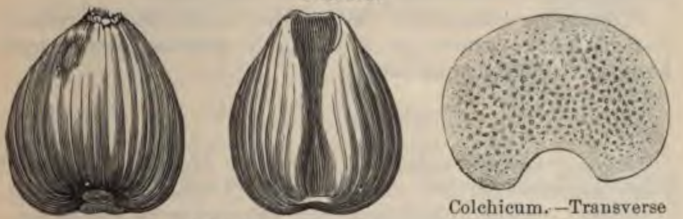
COLCHICI RADIX.—Colchicum Root.

Origin.—Cólchicum autumnále, *Linné*. *Natural order*, Liliàceæ, Colchiceæ.

Habitat.—Southern and Central Europe.

Description.—Developed from the base of the parent tuber, producing flowers in autumn, fruit in the following summer, and in the second year a new tuber, when it shrivels and disappears. About 25 to 40 millimeters (1 to 1½ inches) long, ovoid, flattish, and with a groove on one side; externally brownish and wrinkled; internally white and solid; often in transverse slices, reniform in shape, breaking with a short mealy fracture, inodorous, taste sweetish, bitter, and somewhat acrid.

Fig. 103.



Tuber of Colchicum.

Colchicum.—Transverse section.

Colchicum root breaking with a horny or very dark colored fracture should be rejected.

Structure.—The predominating tissue is parenchyme, containing starch and occasionally raphides; vascular bundles numerous, scattered; nucleus sheath wanting.

Constituents.—Starch, gum, sugar, resin, fat, colchicine (about 0.5 per cent.). (See Colchici Semen.)

Properties.—Cathartic, emetic, sedative; in gout and rheumatism. *Dose*, 0.1 to 0.5 gram (gr. jss–viij), in powder, wine, fluid extract, or extract.

Antidotes.—Evacuation (stomach pump or emetics); tannin; demulcents; stimulants.

ARUM.—Indian Turnip, Dragon Root.

Origin.—Arisæ'ma (A'rum, *Linné*) triphy'llum, *Torrey*. *Natural order*, Aroideæ, Arineæ.

Habitat.—North America, in rich woods.

Description.—Developed from the end of short rhizomes. Depressed globular, 2 to 5 centimeters ($\frac{4}{5}$ to 2 inches) broad, above with a zone of numerous simple rootlets, the lower surface wrinkled; externally brown-gray, internally white, mealy, with scattered wood-bundles; inodorous, taste burning, acrid.

Constituents.—Starch, mucilage, sugar, fat, a volatile acrid principle, soluble in ether. According to R. A. Weber (1891) the acridity is due to raphides of calcium oxalate.

European dragon-root, from A'rum maculátum, *Linné*; A. Dracúnculus, *Linné*; and A. itálicum, *Lamarck*. Oval or oblong, with radicles on the lower side, in commerce often peeled, and in white mealy sections; very acrid.

Properties.—Stimulant, diaphoretic, expectorant, irritant. *Dose*, 0.5 to 1 gram (gr. viij–xv), in powder, mixed with honey, externally in ointment.

SALEP.– Salep.

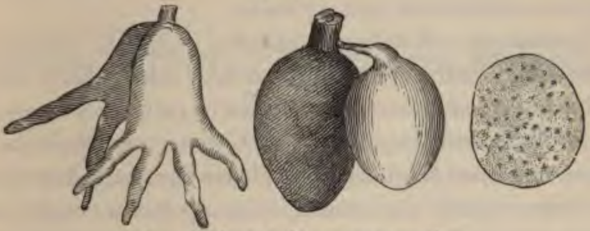
Origin.—O'rchis máscula, *Linné*, O. Mório, *Linné*, and other species of Orchis. *Natural order*, Orchideæ, Ophrideæ.

Habitat.—Central and Southern Europe, in rich woods.

Description.—Oblong or ovate, 25 millimeters (1 inch) or less long, deprived of the epidermal layer, and scalded, brown-yellow, hard, translucent, internally horny; inodorous, taste insipid. The tissue contains scattered vascular bundles, parenchyme with pasty starch, or occasionally with raphides, and large cells containing mucilage. The powder is pale grayish-yellow.

The tubers of O'rchis latifólia, *Linné*, O. maculáta, *Linné*, and others, closely resemble the preceding, but below are palmately divided (radix palmæ Christi).

FIG. 104.



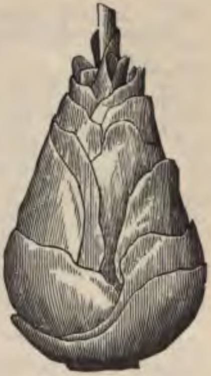
Salep.—Tubers and transverse section.

Constituents.—Starch 27, mucilage 48, sugar, proteids, and ash about 2 per cent. One part of powdered salep with 50 of boiling water yields, after cooling, a jelly.

Properties.—Demulcent, nutritive.

SCILLA.—SQUILL.

FIG. 105.



Scilla.—Bulb.

Origin.—Urginéa Scílla, *Steinheil*, s. Scílla marítima, *Linné*. *Natural order*, Liliaceæ, Scilleæ.

Habitat.—Basin of the Mediterranean near the sea.

Description.—Bulb broadly ovate or pear-shaped, 10 to 15 centimeters (4–6 inches) in diameter; in commerce usually the fleshy scales, rejecting the insipid inner ones; narrow segments about 5 centimeters (2 inches) long, and 3 millimeters ($\frac{1}{8}$ inch) thick, slightly translucent, yellowish-white or reddish, brittle and pulverizable when dry, flexible and tough, horny on exposure; inodorous, mucilaginous, bitter and acrid.

Structure.—The thin-walled parenchyme contains mucilage and numerous raphides, and is traversed by parallel vascular bundles, and small laticiferous ducts; the epidermis on both sides with stomata.

Constituents.—Mucilage, sinistrin, $C_6H_{10}O_5$ (lævogyre; resembling dextrin; easily converted into sugar), sugar, crystals of calcium oxalate; the active principles are scillipicrin (yellowish, hygroscopic, bitter, very soluble in water, acts upon the heart), scillitoxin (brown, bitter burning taste, soluble in alcohol, acts upon the heart), and scillin (crystalline, soluble in alcohol and boiling ether, produces numbness, vomiting, etc.) [Merck]. Jamersted's scillain is a yellowish glucoside, soluble in alcohol, poisonous. Ash about 3 per cent.

Properties. — Expectorant, diuretic, cathartic, emetic, irritant. *Dose*, 0.03 to 0.3 or 0.6 gram (gr. ss–v–x), in powder, vinegar, syrup, or tincture.

ALLIUM.—GARLIC.

Origin.—A′llium satívum, *Linné.* *Natural order*, Liliaceæ, Allieæ.

Habitat.—Asia and Southern Europe, cultivated.

Description.—Bulb subglobular, compound, consisting of about eight compressed wedge-shaped bulblets, which are arranged in a circle around the base of the stem and covered by several dry membranaceous scales. It has a pungent, disagreeable odor, and a warm, acrid taste. It is used only in the fresh state.

Hybrids of the above species with A′llium Pórrum, *Linné*, and perhaps with other species of Allium, are frequently met with.

Constituents.—Mucilage 35 per cent., albumin, volatile oil ¼ per cent., consisting of oxide and sulphides of allyl (C_3H_5).

Properties.—Stimulant, diuretic, expectorant, anthelmintic, irritant.

Dose.—2 to 4 grams (ʒss–j), as expressed juice or syrup.

4. TWIGS AND WOODS—STIPITES ET LIGNA.

The twigs are the overground stems and branches of perennial herbaceous or suffruticose plants, deprived of leaves, flowers, and fruit; they consist of a woody column, enclosing a pith and covered by a green bark. The twigs of one plant only are now officinal.

The medicinal woods are derived from dicotyledonous trees, and as used in pharmacy have the bark removed.

Histology.—The woods consist principally of prosenchyme, the elongated wood-fibres with tapering ends and thickened cell-walls (libriform), associated with ducts (tracheæ), which, upon transverse section, appear as pores. With the exception of the annular and spiral ducts near the medullary sheaths, the ducts are mostly dotted. The wood of Coniferæ is destitute of ducts, and the wood-fibres on their lateral walls are marked with disks; they are distinguished as tracheïds. The wood encloses a pith composed of parenchyme, and is radially dissected by medullary rays, which, upon transverse section, appear as fine lines separating the narrow wood-wedges, upon radial section as broader bands, and upon tangential section as short vertical striæ, which are narrowed at both ends. The medullary rays consist of parenchyme cells, somewhat elongated in the radial direction, forming either a single row, or broader rows of two or more cells, and vertically a layer of six or more cells. Parenchyme is also found scattered in some woods or accompanying the ducts and, extending laterally, sometimes forming more or less complete circles; its cells are vertically elongated and it is designated as wood parenchyme. The wood-cells formed in the spring are larger, those formed toward the close of the season are thinner and more compact; the annual layers or circles of wood are thus plainly indicated by the abrupt transition from the growth of one year to that of the next. In woods from tropical countries the annual layers are less distinctly marked, and often cannot be recognized. The inner layer of wood, from deposits upon its cell-walls, is harder, denser, and frequently of a darker color than the outer layer; the former is called the heartwood or duramen, the latter is the sapwood, or alburnum.

The structural characters of the dicotyledonous woods depend upon the vertical course of the wood-fibres, the width and thickness of the medullary rays, the size and distribution of the ducts, the presence or absence of the wood-parenchyme, etc.

Classification.

Twigs; nodes alternate; cylindrical; taste bitter-sweet.	Dulcamara.
pentangular; taste bitter, nauseous.	Scoparius (see Herbs).
Woods containing ducts.	
Annual layers distinct.	
Pale reddish-brown; soft; aromatic.	Sassafras.
Annual layers indistinct, or with irregular circles of wood-parenchyme.	
Bark present; yellowish-gray; bitter.	Gouania.
Bark mostly absent; wood whitish, very bitter.	Quassia.
greenish-brown, heavy, taste somewhat acrid.	Guaiacum.
dark-red, ducts large; nearly tasteless, not coloring water.	Santalum rubrum.
dark-red, ducts fine; astringent and sweetish, tingeing water red.	Hæmatoxylon.
yellowish or whitish, ducts fine; on rubbing aromatic.	Santalum album.

DULCAMARA.—BITTERSWEET.

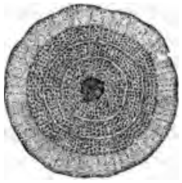
Origin.—Solánum Dulcamára, *Linné*. *Natural order*, Solanaceæ, Solaneæ.

Habitat.—Europe and Asia; naturalized in North America.

Description.—Cylindrical, somewhat angular; longitudinally striate, more or less warty; usually hollow in the centre; about 6 millimeters (¼ inch) or less thick, cut into short sections; externally pale greenish or light greenish-brown, marked with alternate leaf-scars, and internally green, with a greenish or yellowish wood. Odor slight; taste bitter, afterward sweet.

Structure.—Cork thin, gray-brown; bark thickish, composed of parenchyme, with few bast fibres, and with narrow medullary rays; wood in one or two circles with large ducts and numerous one-rowed medullary rays; pith prominent, but mostly hollow. The parenchyme contains minute starch grains and chlorophyll.

FIG. 106.



Dulcamara.—Transverse section, magnified 3 diam.

Constituents.—Resin, gum, wax, starch, calcium lactate, an amorphous alkaloid (solanine?), and the glucoside dulcamarin, $C_{22}H_{34}O_{10}$ (0.4 per cent.), which is soluble in water and alcohol, yields frothing solutions, and has a bitter and sweet taste.

Properties.—Deobstruent, alterative, resolvent, anodyne. *Dose*, 4 to 8 grams (ʒj–ij), in decoction, fluid extract, or extract.

SASSAFRAS LIGNUM (RADIX).—SASSAFRAS WOOD (ROOT).

Origin.—Sássafras officinále, *Nees.* *Natural order,* Laurineæ, Litseaceæ.

Habitat.—North America, woods.

Description.—In branching billets or logs, partly covered with bark, or in chips; pale brownish or reddish, coarse-grained, soft, with narrow medullary rays, large ducts, and oil cells scattered in the different tissues; odor and taste aromatic.

Constituents.—Volatile oil, tannin, starch.

Properties and Uses.—Like sassafras bark.

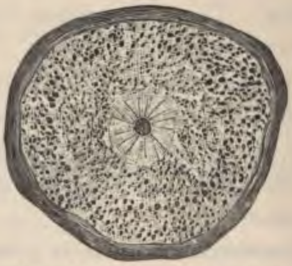
GOUANIA.—CHEWSTICK.

Origin. — Gouánia domingénsis, *Linné.* *Natural order,* Rhamneæ, Gouanieæ.

Habitat.—West Indies.

Description.—Pieces of stems about 12 millimeters (½ inch) thick; externally brownish-gray; wrinkled; internally yellowish gray; fracture fibrous; bark thin; wood porous; medullary rays fine; the parenchyme contains many cells with crystals; inodorous, taste bitter.

FIG. 107.



Gouania —Transverse section.

Constituents.—Bitter principle.

Properties.—Tonic.

QUASSIA.—Quassia.

Origin. — Picræ'na (Simarúba, *De Candolle*, Quássia, *Swartz*) excélsa, *Lindley*. *Natural order*, Simarubeæ, Picramnieæ.

Habitat.—Jamaica.

Description.—Various sized billets, sometimes 30 centimeters (12 inches) thick, dense, tough, of medium hardness, freed from the thick tough bark, internally porous, yellowish-white, radially striate and marked with irregular circles; in the shops usually in raspings or chips; inodorous, intensely bitter.

Structure.—Ducts large, mostly in small groups; medullary rays of about three rows of cells; circular zones of wood parenchyme distinct in layers of 4 to 6 cells; central pith thin. Externally and internally occasionally with blackish patches or lines from the mycelium of a fungus.

Surinam quassia, from Quássia amára, *Linné*, is in much thinner billets, has a thin, brittle bark, smaller ducts, narrower zones of wood parenchyme in layers of 2 or 3 cells, and indistinct medullary rays of mostly one cell in width.

Constituents.—Mucilage, pectin, resin, alkaloid (? fluorescent in acidulated alcoholic solution), picrasmin (a mixture of crystalline compounds, homologous with the quassin, $C_{32}H_{40}O_{10}$, of Surinam quassia; these principles are very bitter, are soluble in chloroform, in alcohol, and in water, and are precipitated by tannin). The wood is free from tannin and yields 7 to 8 (Surinam quassia 3 to 4) per cent. of ash.

Properties.—Tonic, febrifuge. *Dose*, 1 to 4 grams (gr. xv–ʒj), in infusion, tincture, or extract.

GUAIACI LIGNUM.—Guaiacum Wood.

Origin.—Guaíacum officinále, *Linné*. *Natural order*, Zygophylleæ.

Habitat.—West Indies and Northern South America.

Description.—In billets and logs, with a yellowish alburnum; heavy, hard, brown or greenish-brown, resinous, internally marked with irregular concentric circles; splitting very irregular, wavy and splintery; when heated emitting a balsamic odor; taste slightly acrid.

Used in the form of raspings, which should be greenish-brown, contain few particles of a whitish color, and on the addition of nitric acid acquire a dark blue-green color.

Structure.—The predominating tissue consists of wavy interwoven wood-fibres, with numerous one-rowed medullary rays, large single ducts and narrow lines of wood parenchyme in one or two rows, arranged in irregular and interrupted circles. All cells contain resin.

Constituents.—Resin 20 to 25 per cent. (see Guaiaci resina); extractive, soluble in water, 3 to 4 per cent., ash less than 1 per cent.

Properties.—Diaphoretic, alterative. *Dose*, 2 to 8 grams (ʒss–ij), in decoction.

SANTALUM RUBRUM.—Red Saunders.

Origin.—Pterocárpus santalínus, *Linné filius*. *Natural order*, Leguminosæ, Papilionaceæ, Dalbergieæ.

Habitat.—Madras; cultivated.

Description.—In billets deprived of light-colored sapwood, heavy, hard; splitting coarsely splintery; externally dark red-brown; the fresh transverse section deep red marked with lighter red indistinct radiating lines and distinct irregular concentric circles; inodorous and nearly tasteless; on maceration in water does not color it. Used in the form of chips or of an irregular powder, of a deep brown-red or purplish-red color.

Structure.—Ducts large; medullary rays one-rowed; wood parenchyme in about four rows, forming interrupted irregular circles. The cells contain red resinous coloring matter, the parenchyme also crystals of calcium oxalate.

Constituents.—Santalin, $C_{15}H_{14}O_5$ (red needles, soluble in ether with a yellow, and in alkalies with a violet color); santal, $C_8H_6O_3$ (colorless scales, in alcoholic solution deep red by Fe_2Cl_3); pterocarpin, $C_{20}H_{16}O_6$, and homopterocarpin, $C_{24}H_{24}O_6$ (colorless crystals, the latter soluble in cold CS_2; fused with HKO yields phloroglucin).

Used for coloring tinctures.

HÆMATOXYLON.—LOGWOOD.

Origin.—Hæmatóxylon campechiánum, *Linné. Natural order*, Leguminosæ, Cæsalpinieæ, Eucæsalpinieæ.

Habitat.—Central America, naturalized in the West Indies.

Description.—In logs; heavy, hard, splitting irregularly, externally blackish-purple, often with a green metallic lustre; fracture coarse splintery; internally brown-red, finely porous, marked with irregular concentric circles and numerous delicate radiating lines; odor faint, agreeable; taste sweetish, astringent; colors the saliva dark pink. Used in the form of small chips or coarse powder of a dark brown-red color, often with a greenish lustre.

Structure.—Ducts rather large, often in groups of two; medullary rays about two-rowed; wood parenchyme in broader wavy circular lines. The coloring matter is deposited mainly in the wood-fibres and ducts.

Constituents.—Hæmatoxylin, $C_{16}H_{14}O_6$, colorless, sweet, soluble in water and alcohol, turning red in sunlight, purplish by alkalies; fused with potassa yields pyrogallol. Hæmatein, $C_{16}H_{12}O_6$, is a product of oxidation of the former, has a green metallic lustre, and is soluble in alkalies with a blue color. Also tannin, fat, resin, trace of volatile oil.

Properties.—Astringent, tonic. *Dose,* 2 to 4 grams (ʒss–j), in decoction or extract.

SANTALUM ALBUM.—Sandalwood.

Origin.—1. Sántalum álbum, *Linné*; 2. S. Yási, *Seemann,* and other species. *Natural order,* Santalaceæ, Osyrideæ.

Habitat.—1. Southern India; 2. Fijee Islands; other species in Australia, the Sandwich Islands, etc.

Description.—Malabar sandalwood is in billets, or logs, 10 to 20 centimeters (4 to 8 inches) thick, splitting readily, heavy, hard, yellowish, brownish or whitish, marked with darker circles; odor when rubbed aromatic, somewhat musk-like; taste aromatic.

Structure.—Ducts of moderate size, single; wood parenchyme narrow, contains volatile oil or calcium oxalate; medullary rays very narrow, in one or two rows.

Macassar sandalwood resembles the preceding in all essential characters; but on treating sections with tincture of iodine the oil is colored black.

West Indian sandalwood resembles the former in color but not in structure; the ducts are in radial rows of two to ten; no essential oil is present in the wood, but numerous oil cells are scattered in the bast layer of the bark.

Constituents.—Resin, tannin, volatile oil 1–4 per cent.; the latter is yellow, thick; sp. grav. 0.96; readily soluble in alcohol while fresh, strongly aromatic, but varying somewhat with its origin.

Properties.—The volatile oil stimulant, sudorific, used in gonorrhœa in doses of 0.5 to 1 or 1.5 gram (gr. viij–xv–xxij), also in perfumery; the wood for fancy articles.

5. BARKS.—CORTICES.

Barks constitute the outer layer of dicotyledonous stems and roots, separated from the wood by the cambium layer, and are collected mostly from the trunk or stem and its larger branches, in a few cases from the root. The outer surface of the stem bark is not unfrequently beset with larger or smaller patches of lichens; the inner surface, immediately after the removal of the bark from the wood, is mostly whitish or light colored and smooth, but darkens more or less on drying, and often becomes rough or ridged in consequence of the unequal shrinkage of different parts of the tissue.

Histology.—The bark consists originally of two layers, the outer bark wholly composed of parenchyme, containing chlorophyll; and the inner bark, bast or liber, which is composed of vertically elongated bast parenchyme, and of bast prosenchyme or liber fibres, and this tissue is radially dissected by medullary rays, formed of radially elongated parenchyme. The pharmacopœial root barks are destitute of liber fibres. The epidermis is present only in very young barks; its place is soon taken by the primary cork, which is frequently present in wart-like projections, or in longitudinal or transverse ridges, and is composed of tangentially flattened cells. The secondary cork, composed of similar cells, penetrates in layers or bands into the outer or inner bark, and the exterior tissue cracks off in layers or falls away by decay. The tissues which may be present in barks are: 1, the epiphlœum or exophlœum, formed by the primary cork; 2, the mesophlœum, primary or outer bark, also sometimes called middle bark; or these two layers may have been thrown off, so that the external layer is formed by 3, the rhytidoma, or secondary cork; 4, the endophlœum or liber. The term periderm is often used to designate the external corky layer, whether it be epiphlœum or rhytidoma, but is by some authors confined to the latter. The parenchyme of some barks contains cells in which volatile oil, resin, mucilage, or crystals are found; and others in which the cell-walls become considerably thickened and indurated, producing the gritty cells or stone cells or sclerenchyme.

Aside from the natural color of the tissue, the appearance of the outer surface of the medicinal barks depends upon the presence or absence of lichens, epiphlœum, mesophlœum, and rhytidoma, and the appearance of the inner surface upon the degree of shrinkage in drying of the medullary rays and bast parenchyme. The breadth of the medullary rays on the other hand, and the radial or lateral arrangement of the bast cells on the other hand, cause the radial, lateral (tangential), or checkered markings upon the transverse section of the inner bark.

Classification.

Sect. 1. Taste bitter and astringent.

Bast fibres with a minute cavity, single, in short radial lines or small groups.	Cinchona.
Bast fibres with larger cavity, in close radial lines; copper-colored.	Remijia.
Bast indistinctly tangentially striate; cork removed; fracture granular.	Nectandra.
Bast radially striate, pale red; periderm brown.	Cornus florida.

Bast radially striate, cinnamon-colored; periderm brown-gray; bark thin.	Cornus circinata.
Bast radially striate, pale brown; periderm purplish-brown; bark thin.	Cornus sericea.
Bast radially striate, whitish; periderm purplish-brown.	Liriodendron.
Bast radially striate, whitish; periderm gray or brownish.	Magnolia.
Bast radially striate, yellowish; periderm grayish, dotted.	Prinos.
Bast radially striate, rust-brown; periderm green brown.	Prunus virginiana.
Bast layers tangential, checkered, yellow, exfoliating.	Berberis.
Bast layers tangential, checkered, pale cinnamon-colored.	Salix.
Bast layers tangential, pale cinnamon-colored; periderm ash-gray, exfoliating.	Hamamelis.
Bast indistinctly striate, whitish; periderm purplish or grayish-brown.	Viburnum.

Sect. 2. Taste astringent.

Bast checkered, pale brown; inner surface ridged; saliva not tinged.	Quercus alba.
Bast checkered, pale brown; inner surface ridged; saliva tinged yellow.	Quercus nigra.
Bast tangentially striate; periderm blackish; inner surface smooth, brownish; tough.	Rubus.
Bast scarcely striate, yellowish; inner surface smooth; fracture short.	Granatum.

Sect. 3. Taste bitter, not aromatic.

Bast radially striate, whitish; inner surface smooth; fracture splintery.	Fraxinus.
Bast radially striate, pale brownish; bark tough.	Simaruba.
Bast radially striate, whitish; periderm blackish; bark tough.	Quassia excelsa.
Bast radially striate, whitish; periderm gray; bark brittle.	Quassia amara.
Bast radially striate, grayish, dotted; slightly acrid.	Condurango.

Bast scarcely striate, brownish-yellow; periderm dark gray.	Frangula.
Bast scarcely striate, yellowish; periderm gray and whitish.	Rhamnus Purshiana.
Bast somewhat checkered; internally with blue-green patches; odor opium-like.	Piscidia.
Bast checkered, brown and white; cork removed; inner surface striate.	Juglans.
Bast yellowish-brown, dotted; outer bark in undulated layers.	Quebracho.
Bast tangentially striate, yellowish; cork rust-brown, tasteless.	Azedarach.

Sect. 4. Taste acrid or pungent.

Slender prickles in transverse rows.	Aralia spinosa.
Brown-gray, inner surface whitish; fracture short; spines brown, two-edged.	Xanthoxylum fraxineum.
Brown-gray, inner surface whitish; fracture short; spines brown, stout, upon a thick, corky base.	Xanthoxylum carolinianum.
Reddish-brown, with thin grayish cork; fracture short.	Myrica.
Red-brown; internally with brown-yellow spots; brittle.	Erythrophlœum.
Bast tangentially striate, tough, whitish; periderm greenish, glossy.	Mezereum.
Bast tangentially striate, tough, whitish; periderm reddish; taste slightly acrid.	Gossypium.
Bast tangentially striate, tough, with yellow dots; cinnamon-brown; aromatic, pungent.	Coto.
Bast tangentially striate, whitish; periderm gray and blackish, scaly; taste slightly acrid and bitter.	Euonymus.
Bast checkered, white or whitish; cork removed; sternutatory.	Quillaia.

Sect. 5. Mucilaginous.

Bast checkered, whitish or brownish; cork removed.	Ulmus.

Sect. 6. Aromatic (some also bitter) with oil or resin cells.

Astringent; compound quills; papery, outer surface lightest.	Cinnamomum.
Astringent; curved or quilled; both surfaces cinnamon-brown.	Cinnamomum cassia.
Astringent; flattish fragments, rust-brown; fracture corky.	Sassafras.
Bitterish, pungent; periderm whitish and reddish, with white scars; bast white.	Canella.
Bitterish, pungent; periderm brown, with dark-brown scars; bast brown.	Cinnamodendron.
Bitterish, pungent; periderm whitish or brown; inner surface ridged; contains tannin.	Wintera.
Very bitter; reddish-brown; in outer bark white striæ.	Angustura.
Very bitter; periderm white, fissured; inner surface brown.	Cascarilla.

CINCHONA.—Cinchona, Peruvian Bark.

Origin.—Between 30 and 36 species of cinchona are usually recognized, of which number about one-half furnish commercial cinchona bark. O. Kuntze regards most of these as hybrids or as varieties, and recognizes only four typical species. Those recognized by the pharmacopœias are mentioned below.

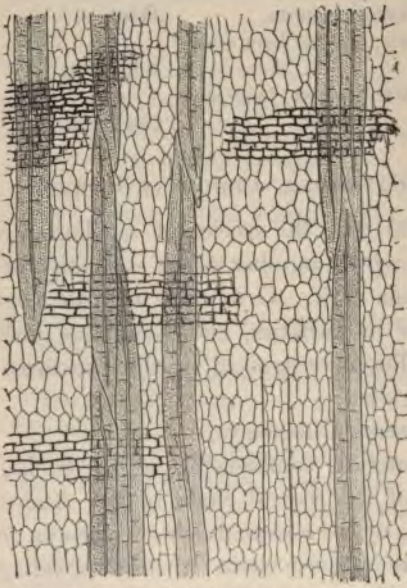
Natural order, Rubiaceæ, Cinchoneæ.

Habitat.—South America, commencing at 19° S. lat., on the eastern slope of the central chain of the Andes, northward to 2° S. lat., where a second belt commences on the eastern slope of the western chain; thence spreading northward into Colombia to 10° N. lat. The valuable species grow at an altitude of 1600 to 2400 meters (5300 to 8000 feet), Cinch. succirubra at 700 meters (2300 feet). Other species of little or no value are found up to 3500 meters (11,600 feet), and down to 100 meters (330 feet). The climate where the best species grow has a mean temperature of 12° to 13° C. (55° F.), and is damp and foggy throughout the greater part of the year.

Cinchonas are now extensively cultivated in Java, India (Neilgherry and Himalaya Mountains), Jamaica (Blue Mountains), and other countries; to a limited extent also in South America. Nearly all the commercial bark is obtained from cultivated trees.

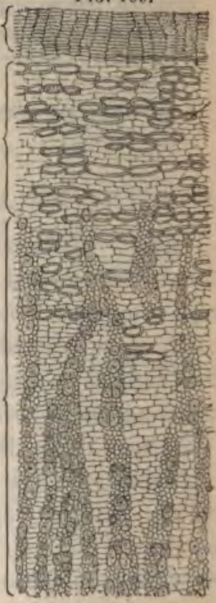
Structural Characteristics.—The bast fibres are short, about 1 millimeter ($\frac{1}{25}$ inch) long, rather fusiform, obtusely pointed, unbranched, have very much thickened cell-walls and a minute cavity, and are quite brittle. They are im-

FIG. 108.



Calisaya bark.—Radial longitudinal section, showing bast fibres, bast parenchyme, and medullary rays.

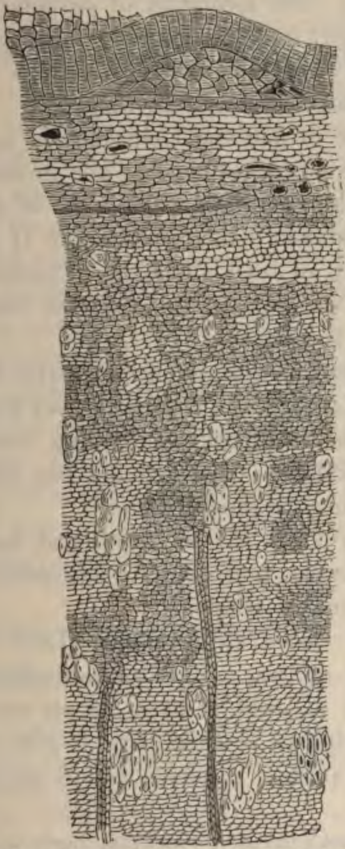
FIG. 109.



Cinchona lancifolia.—Transverse section, magnified 30 diam., showing numerous stone cells in outer bark and outer bast layer; bast cells in interrupted radial lines.

bedded in the bast parenchyme, either singly, or in short radial lines, composed of one or two rows, or in irregular

FIG. 110.



Cinchona micrantha.—Transverse section, magnified 40 diam.; few stone cells in outer bark; bast fibres single and in groups.

groups of 2, 3, or sometimes 6 or 8 cells. The bast rays contain also incomplete fibres or staff cells, which are elongated and thick-walled. The primary bark of some species contains somewhat elongated unbranched laticiferous ducts (vessels, lacunæ) and thick-walled stone cells containing resin or crystals, which are also occasionally found in the medullary rays. The formation of secondary cork bands, penetrating deeply into the interior, causes the absence of these ducts and stone cells in the older trunk bark of some species. The cork cells are thin-walled.

The structure of cultivated cinchona is to some extent modified by the process of mossing and in renewed bark.

Officinal Cinchona Barks.—The bark of any species of cinchona is admitted for medicinal use if containing at least 3 per cent. of total alkaloids. Cinchona flava and cinchona rubra are required to contain at least 2 per cent. of quinine (U. S. Phar).

The Brit. Phar. admits all cinchona barks for the preparation of the alkaloids, but requires for all galenical preparations cultivated red bark—containing between 5 and 6 per cent. of alkaloids—of which not less than half shall consist of quinine and cinchonidine.

The German Phar. directs trunk and branch bark of cultivated cinchonas, preferably C. succirubra, containing at least 5 per cent. of alkaloids.

The French Codex requires pale (Loxa or Huanuco) bark to contain at least 1.5 per cent. of alkaloids; yellow (Calisaya) bark to yield at least 2.5 per cent. of crystallized quinine sulphate, and red bark to give not less than 2 per cent. of quinine sulphate, and 3 per cent. of total sulphates.

Description.—Cultivated cinchona bark is seen in commerce in the form of quills or curved pieces, about 10 centimeters (4 inches) or more in length, the thickness of the bark being usually about 2 or 3 millimeters ($\frac{1}{12}$ or $\frac{1}{8}$ inch), occasionally 5 or 6 millimeters ($\frac{1}{5}$ or $\frac{1}{4}$ inch). The outer surfaces consist of whitish or brown-gray cork, and is more or less rough from scattered, or in older bark more numerous, warts frequently forming longitudinal lines in C. succirubra, from shallow longitudinal furrows and ridges, and from short transverse, sometimes also longitudinal fissures (met with chiefly in C. Calisaya and C. officinalis). The inner surface is of a more or less deep cinnamon-brown, or in thick succirubra bark of a dark reddish-brown color, and is finely, or in older bark more coarsely striate; the fracture is nearly smooth or somewhat granular and short in the thinner quills, or finely fibrous, but never splintery, in the thicker pieces; the powder is cinnamon brown, or from succirubra bark reddish-brown in color; odor slight, somewhat aromatic; taste bitter and distinctly astringent.

These barks contain in their inner layer the characteristic bast fibres described above, and these are seen in the thin quills, mostly single and arranged in interrupted radial lines; the arrangement in bark from old wood is described below; the tissue is never in concentric layers.

On heating about 0.1 gram (1½ grains) of the powdered bark in a dry test-tube, a tarry distillate of a red color is obtained (Grahe's test).

Classification of the Important Cinchona Barks.

1. Bast fibres single, sometimes in groups of 2 or rarely more, medium sized.
    - C. Calisáya. Laticiferous ducts in young bark; no or very few stone (resin) cells; old bark with prominent secondary cork; medullary rays narrow.
    - C. glandulífera. Laticiferous ducts in 1 or 2 rows; stone cells few; bast rays narrow; medullary rays large-celled.
2. Bast fibres single, or oftener in groups, not in distinct radial lines.
    - C. micrántha. No laticiferous ducts; stone cells few or none; bast fibres medium; medullary rays narrow.
    - C. purpúrea. Laticiferous ducts in 1 or 2 rows; stone cells numerous; bast fibres medium, with some incomplete fibres; medullary rays broadly wedge-shaped at end.

C. pubéscens. Laticiferous ducts in 1 row; stone cells numerous; bast fibres large, variable, with incomplete fibres; medullary rays broad.

3. Bast fibres in interrupted, single or double radial lines.

C. succirúbra. Laticiferous ducts in 1 row, in old bark often filled with cells; stone cells none; bast and medullary rays narrow; bast fibres medium.

C. officinális. Laticiferous ducts thin, soon obliterated; stone cells none or very few; bast fibres medium; medullary rays narrow.

C. pitayénsis. Laticiferous ducts none; stone cells few or none; bast fibres thin; medullary rays mostly narrow, wedge-shaped at end.

C. cordifólia. Laticiferous ducts none; stone cells few; bast fibres small, with some incomplete fibres; medullary rays large-celled.

C. lancifólia. Laticiferous ducts none; stone cells many; bast fibres medium, with some incomplete fibres; medullary rays large-celled.

C. nítida. Laticiferous ducts none; stone cells few or none; bast fibres mostly thin, but many thick or medium; medullary rays narrow.

C. peruviána. Laticiferous ducts (in 1 row) and stone cells small; bast fibres small, many incompletely filled.

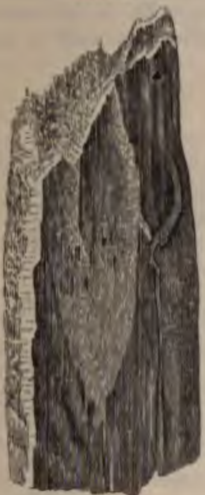
4. Bast fibres in nearly uninterrupted radial lines.

C. scrobiculata. Laticiferous ducts in 1 or 2 rows; stone cells and bast fibres numerous; medullary rays large-celled.

The following cinchona barks were formerly shipped from South America in large quantities; the two or three varieties first described below, are still recognized by several pharmacopœias.

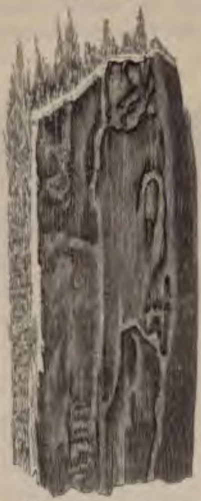
Calisaya bark, or yellow cinchona, the bark of the trunk of Cinchóna Calisáya, *Weddell* (U. S. P., 1880), from Northeastern Bolivia and Southeastern Peru, growing at altitude of 1500–1800 meters (5000–6000 feet). In quills or flat pieces, varying in size; bark 2 or 3 millimeters ($\frac{1}{12}$ or $\frac{1}{8}$ inch) thick, externally gray with fissures forming nearly square meshes with raised edges, internally yellowish, cinnamon-colored; inner surface nearly smooth; fracture granular and short-fibrous; the flat pieces from 4 to 10 millimeters ($\frac{1}{6}$ to $\frac{2}{5}$ inch) in thickness; almost completely deprived of the brown corky layer; compact; of a tawny-yellow color; outer surface marked with shallow conchoidal depressions (digital furrows) and intervening, rather sharp ridges; inner surface closely and finely striate; transverse fracture showing numerous, very short, and rigid, glistening fibres. Powder light cinnamon-brown, slightly aromatic, and persistently bitter. The young bark contains a layer of primary cork, no stone cells, and near the bast rays one or two circles of large laticiferous ducts. The flat bark consists of liber only, has the bast fibres singly or

Fig. 111.



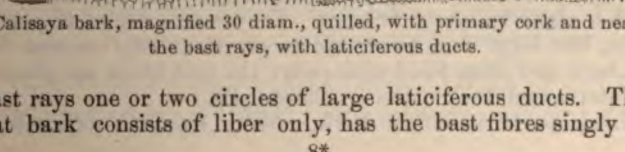
Cinch. Calisaya, showing digital furrow and short fibrous fracture.

Fig. 112.



Cinch. scrobiculata.

Fig. 113.

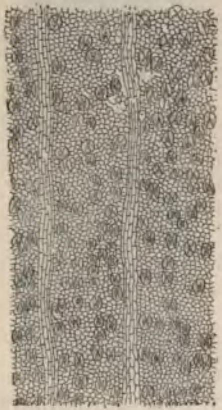


Calisaya bark, magnified 30 diam., quilled, with primary cork and near the bast rays, with laticiferous ducts.

sometimes in pairs, arranged in radial lines, and contains bands of secondary cork.

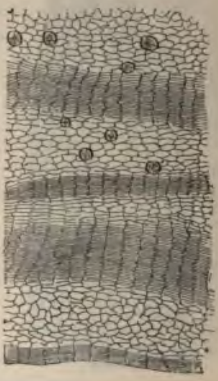
Calisaya bark was sometimes confounded with other cinchona barks of a similar color, but having the bast fibres in bundles or radial rows, and breaking with a splintery or coarsely fibrous fracture (Cinch. scrobiculata and C. lancifolia).

Fig. 114.



Flat, inner layer; with narrow medullary rays and single bast fibres in radial lines.

Fig. 115.



Flat, outer layer; with bands of secondary cork and distant bast fibres.

Red Cinchona from Cinchóna succirúbra, *Pavon*, indigenous to Ecuador, west of Chimborazo, at an altitude of 700–1500 meters (2300–5000 feet). Incurved pieces or quills, varying in length and width, and from 2 to 12 millimeters ($\frac{1}{12}$ to $\frac{1}{2}$ inch) thick; compact; of deep brown-red color; outer surface covered with numerous suberous warts, and in the older bark, with ridges, or longitudinally and somewhat transversely fissured; inner surface rather coarsely striate; transverse fracture short-fibrous; powder deep brown red, slightly odorous, astringent, and bitter. It should not be confounded with other barks having an orange-red color and breaking with a coarse splintery fracture. The tissue contains no stone cells; the large laticiferous ducts are frequently present in old bark and often filled with cells; the bast fibres are placed in interrupted lines of two to about eight.

Loxa bark or crown bark, chiefly from C. officinális, *Hooker.* Thin single or double quills; periderm brown or gray-brown, more or less fissured transversely, otherwise smooth; liber yellowish-brown or reddish-brown; fracture slightly fibrous in inner layer; powder pale brown.

Pitaya bark, from C. Pitayénsis, *Weddell.* Periderm smooth, ochre-colored, with circular scars; liber reddish cinnamon-brown; fracture short splintery; powder bright brown-yellow.

Cusco bark, from C. pubéscens, *Vahl.* Periderm pale brown-yellow, warty, sometimes whitish; liber cinnamon-colored, with a coarse splintery fracture.

Carthagena bark, from C. lancifólia, *Mutis,* and C. cordifólia, *Mutis.* Quills and half-quills; periderm whitish, ochre-colored or yellowish-brown, soft; inner surface cinnamon-brown, with orange or reddish tint; inner fracture fibrous.

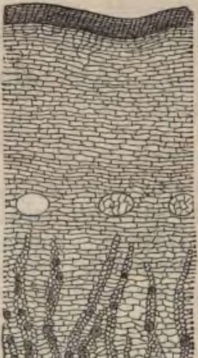
Lima or Huanuco bark, from C. peruviána, *Howard,* C. nítida, *Ruiz et Pavon,* C. micrántha, *R. & P.,* and other species. Quills and half-quills, varying according to the origin.

Huamalies bark, from C. micrántha, *Ruiz et Pavon,* C. glandulífera, *R. & P.,* C. purpúrea, *R. & P.,* and other species. Quills and half-quills, varying according to origin.

Jaen bark or false Loxa bark, from C. Humboldtiána, *Lambert.* Inferior.

Cinchona Pahudiána, *Howard,* formerly cultivated in Java. Bark of handsome appearance, but inferior.

FIG. 116.



Cinchona succirubra.—Transverse section, magnified 30 diam.

Spurious Cinchona Barks.—From different species of Ladenbergia, Exostemma, Nauclea, etc. The liber layer is more or less distinctly radially striate or checkered, and contains bast fibres with large cavity, variously arranged. Occasionally a bast fibre like those of the cinchonas is observed. These are rarely, if ever, seen in commerce at the present time.

Constituents.—Kinic (quinic) acid, $C_7H_{12}O_6$ (5 to 7 per cent., yields kinone, $C_6H_4O_2$, with sulphuric acid and manganese binoxide); kinovic (quinovic) acid, $C_{32}H_{48}O_6$) tasteless); kinovin (quinovin), $C_{30}H_{48}O_8$ (bitter; yields kinovic acid and mannitan); cinchotannic acid (usually 2 to 4 per cent.); cinchona red (derivative of the preceding); volatile oil (minute quantity), gum, sugar, wax, ash (2–3 per cent.). The most important constituents are the following five alkaloids: quinine and quinidine (conquinine), $C_{20}H_{24}N_2O_2$); cinchonine and cinchonidine, $C_{19}H_{22}N_2O$ (older formula, $C_{20}H_{24}N_2O$); quinamine, $C_{19}H_{24}N_2O_2$. Their properties are as follows:

		Soluble in parts of				Cl, KCfo,
Alkaloids.	Rotation.	Water.	Alcohol.	Ether.	Cl and NH_3	and NH_3.
Quinine	left	1670	6	26	green	dark red
Quinidine	right	2000	26	30	green	dark red
Cinchonine	right	3740	133	370	not gr.	not red
Cinchonidine	left	1680	20	188	not gr.	not red
Quinamine	right	1520	110	55	not gr.	not red

A large number of allied alkaloids have been obtained, some of which are known to be produced under the influence of heat or of reagents:

Isomeric with quinine are quinidine and quinicine.

Isomeric with quinamine are conquinamine, quinamidine, quinamicine.

Isomeric with cinchonine are cinchonidine, cinchonicine, homocinchonine, homocinchonidine, homocinchonicine, and apoquinamine.

In the preparation of the cinchona alkaloids a mother-liquor is obtained yielding a brown amorphous alkaloid known as chinoidine (quinoidine), which is usually a mixture of dicinchonicine $C_{38}H_{44}N_4O_2$ ($=2C_{19}H_{22}N_2O$), and diconquinine (diquinidine), $C_{40}H_{46}N_4O_3$ ($=2C_{20}H_{24}N_2O_2 - H_2O$); the latter gives the chlorine water and ammonia the green thalleioquin color.

Other alkaloids obtained from varieties of cinchona barks are—paricine, $C_{16}H_{18}N_2O$, in red bark; cusconine and aricine, $C_{23}H_{26}N_2O_4$, in Cusco bark; paytine, $C_{21}H_{24}N_2O$, in Payta bark.

Properties.—Astringent, tonic, antiperiodic, febrifuge. *Dose,* 1 to 4 grams (gr. xv–ʒj), in powder, fluid extract, extract, or the salts of the alkaloids.

REMIJIA.—CUPREA BARK.

Origin.—Remíjia pedunculáta, *Triana.* *Natural order,* Rubiaceæ, Cinchoneæ.

Habitat.—Colombia, central part, at an altitude of 1000 to 2000 meters (3300 to 6600 feet).

Description.—Flat or curved pieces, about 3 to 6 millimeters (⅛ to ¼ inch) thick, rarely in quills, mostly deprived of the warty and furrowed brownish cork, otherwise of a characteristic dull copper-red color; the inner surface striate; hard, fracture coarsely granular and splintery; odor slight; taste bitter, somewhat astringent. The cork cells are thick-walled; the primary bark contains a few laticiferous ducts; the bast fibres, with rather large cavities and obtuse ends, are in close radial lines most numerous in the outer bast layer; numerous stone cells are found in the primary bark and the bast layer. Cuprea bark, powdered and heated in a dry test-tube, yields a tarry distillate of a red color (Grahe's test).

Constituents.—Quinine, 2 to 3 per cent., quinidine and cinchonine, also kinovin, but no cinchonidine. Quinine exists in part as homoquinine, which is a compound of quinine with cupreine, $C_{19}H_{22}N_2O_2$; the latter dissolves with difficulty in ether and chloroform, is colored red-brown by ferric chloride, and green by chlorine and ammonia, and may be converted into quinine by treatment with methyl chloride.

Remíjia Purdieána, *Weddell,* which is also a native of Colombia, yields a bark of a yellowish-brown color, covered with a brown-gray cork, and containing radial rows of thin bast fibres with rather large cavities, and scattered stone cells in the primary bark, but none in the bast layers. It does not respond to Grahe's test, and contains the alkaloids cinchonamine, concusconine, chairamine, conchairamine, chairamidine, and conchairamidine.

Properties.—Tonic, febrifuge. Cuprea bark has been used for the manufacture of quinine.

NECTANDRA.—Bebeeru. Greenheart Bark.

Origin.—Nectándra Rodiæ'i, *Schomburgk.* *Natural order*, Laurineæ, Perseaceæ.

Habitat.—Guiana.

Description.—Flat pieces, 6 millimeters (¼ inch) or less thick; outer surface gray-brown, with numerous longitudinal depressions; inner surface cinnamon-colored, coarsely striate; fracture granular from the numerous stone cells, in the liber somewhat tangentially striate; inodorous; taste astringent and bitter.

Constituents.—Bebirine, $C_{18}H_{21}NO_3$, identical with buxine and pelosine, white, soluble in ether; sipirine, red-brown, amorphous, insoluble in ether.

Properties.—Tonic, febrifuge, antiperiodic. *Dose*, 2 to 4 grams (ʒss–j); mostly the alkaloid, 0.06 to 0.6 gram (gr. j–x).

CORNUS.—Dogwood.

Origin.—Córnus flórida, *Linné.* *Natural order*, Cornaceæ.

Habitat.—North America, westward to Minnesota and Texas, in woods.

Description.—The bark of the root is collected and is deprived of the furrowed brown-gray corky layer; in curved pieces of various sizes, about 3 millimeters (⅛ inch) thick; outer and inner surface pale reddish or light reddish-brown, striate; transverse and longitudinal fracture short, whitish, with brown-yellow striæ of stone cells; inodorous; astringent and bitter.

Constituents.—Cornin (cornic acid, silky needles, bitter, soluble in water and alcohol), tannin (3 per cent.), resin, gum, etc.

Properties.—Astringent, tonic, febrifuge. *Dose*, 1 to 4 grams (gr. xv–ʒj), in decoction and fluid extract.

The bark of Córnus circináta, *L'Héritier*, or round-leaved dogwood, is thin, quilled, or curved; outer surface greenish or brownish-gray, with suberous warts or longitudinal lines; inner surface cinnamon-brown.

The bark of Córnus serícea, *Linné*, or swamp dogwood, is quilled, thin; outer surface purplish-brown or purplish-gray, with few suberous warts; inner surface cinnamon-brown.

These barks agree with that of Cornus florida in taste, constituents, and properties.

LIRIODENDRON.—Tulip-tree Bark.

Origin.—Liriodéndron Tulipífera, *Linné*. *Natural order*, Magnoliaceæ, Magnolieæ.

Habitat.—United States, westward to Eastern Kansas, in woodlands; also in China.

Description.—The bark of the branches is collected. Quills or curved pieces, about 2 millimeters ($\frac{1}{12}$ inch) thick; outer surface purplish-brown or blackish-gray, with thin, often cleft ridges forming elongated meshes; internally whitish, smooth; transverse fracture short, somewhat fibrous in the inner layer; nearly inodorous; taste somewhat astringent, pungent, and bitter. The bark of old wood deprived of the corky layer is whitish, fibrous, and less pungent.

Constituents.—Little volatile oil, various resins (including liriodendrin), glucoside, tulipiferine (white tasteless alkaloid; heart tonic), tannin, coloring matters, gum, etc.

Properties. — Tonic, febrifuge, vermifuge. *Dose*, 4 to 8 grams (ʒj–ij), in infusion or fluid extract.

MAGNOLIA.—Magnolia.

Origin.—Magnólia glaúca, *Linné*, M. acumináta, *Linné*, and M. tripétala, *Linné*. *Natural order*, Magnoliaceæ, Magnolieæ.

Habitat.—Middle and Southern United States.

Description.—Thin quills or curved pieces; periderm orange-brown, glossy, or light gray, with scattered warts, somewhat fissured; inner surface whitish or brownish, smooth; fracture in inner layer somewhat fibrous; inodorous; taste somewhat astringent, pungent, and bitter. The bark of old wood deprived of the corky layer is whitish, or pale brownish, fibrous, and less pungent.

Constituents.—Little volatile oil, resins, a tasteless crystalline glucoside, tannin, coloring matters, gum, etc. Magnolin is a crystalline principle of the fruit of M. tripetala, having an irritating taste, or when pure tasteless, insoluble in water, soluble in most simple solvents and in alkalies. The identity of the crystalline principles in the bark and fruit of the different species has not been demonstrated.

Properties.—Diaphoretic, tonic, febrifuge. *Dose*, 2 to 4 grams (ʒss–j), in decoction.

PRINOS.—Black Alder, Winterberry.

Origin.—Ilex verticilláta, *Gray*, s. Prínos verticillátus, *Linné*. *Natural order*, Ilicineæ.

Habitat.—North America, south to Florida, in swampy thickets.

Description.—Thin slender fragments, about 1 millimeter ($\frac{1}{25}$ inch) thick, fragile; outer surface brownish ash-colored, with whitish patches and blackish dots and lines, the corky layer easily separating from the green tissue; inner surface pale greenish or yellowish; fracture short, tangentially striate; nearly inodorous, bitter, slightly astringent.

Constituents.—Tannin, wax, fat, resin, chlorophyll, albumin, sugar, gum, starch, amorphous bitter principle, which is precipitated by subacetate of lead; ash 4 to 5 per cent.

Properties.—Astringent tonic, alterative, febrifuge. *Dose*, 2 to 4 grams (ʒss–j), in decoction or fluid extract.

PRUNUS VIRGINIANA.—Wild Cherry Bark.

Origin.—The bark of Prúnus (Cérasus, *Loiseleur*) serótina, *Ehrhart.* *Natural order*, Rosaceæ, Pruneæ.

Habitat.—North America, westward to Minnesota and Louisiana; in woods.

Description.—Curved pieces or irregular fragments, 2 millimeters ($\frac{1}{12}$ inch) or more thick; outer surface greenish-brown or yellowish-brown, smooth, and somewhat glossy; if collected from old wood deprived of most of the corky layer, the outer surface rust-brown and uneven; inner surface somewhat striate, cinnamon-brown; brittle; fracture granular, radially striate; after maceration in water, of a distinct bitter almond odor; taste astringent, aromatic, and bitter.

It should be collected in autumn. The bark of the small branches is to be rejected.

Constituents.—Tannin, gallic acid (?), bitter principle, resin, starch, amorphous principle (somewhat bitter, soluble in alcohol and not precipitated by ether), and a ferment which is not identical with emulsin (Power, 1887). The reaction in water of the two last-named principles generates hydrocyanic acid and oil of bitter almond. Collected in October, the bark yields 0.144 per cent. HCy, contains about 3½ per cent. of tannin, and yields a dark-colored infusion. The bitter taste is partly due to a glucoside, crystallizing in colorless needles, soluble in ether, and showing blue fluorescence in aqueous and alkaline solution.

Properties.—Tonic, sedative, pectoral. *Dose*, 2 to 4 grams (ʒss–j), in infusion, syrup, or fluid extract.

BERBERIS.—Barberry Bark.

Cortex radicis berberidis.

Origin.—Bérberis vulgáris, *Linné.* *Natural order*, Berberidaceæ, Berbereæ.

Habitat.—Europe and Western Asia; naturalized in North America.

Description.—Thin fragments; periderm yellowish gray, soft; inner surface smooth, orange-yellow; fracture short, bright yellow; separable in laminæ; inodorous; taste bitter, not astringent, tingeing the saliva yellow.

Constituents.—Little tannin (green with ferric salts), wax, fat, resin, albumin, gum, starch, berberine 1¼ per cent. (see Hydrastis), oxyacanthine, $C_{19}H_{21}NO_3$ (vinetine, or berbine; bitter, white, soluble in alcohol, ether and chloroform; separates iodine from iodic acid; isomeric with thebaine; the salts sparingly soluble in sodium phosphate), berbamine, $C_{18}H_{19}NO_3$ (white, the salts sparingly soluble in sodium nitrate), and a fourth amorphous alkaloid. A dilute solution of potassium ferricyanide with ferric chloride is colored blue by salts of berbamine and oxyacanthine.

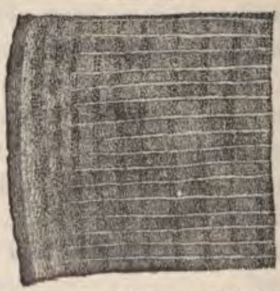
Properties.—Tonic, febrifuge, in large doses laxative. *Dose,* 0.2 to 0.6 gram (gr. iij–x), in powder or decoction.

SALIX.—WILLOW.

Origin.—Sálix álba, *Linné,* and other species of Salix. *Natural order,* Salicaceæ.

Habitat.—Europe, naturalized in North America; cultivated.

FIG. 117.



Salix.—Transverse section, magnified 15 diam.

Description.—Collected from branches several years old. Fragments or quills, 1 or 2 millimeters ($\frac{1}{25}$ or $\frac{1}{12}$ inch) thick, smooth; outer surface somewhat glossy, brownish, or yellowish, more or less finely warty or somewhat transversely ridged, under the corky layer green; inner surface brownish-white, smooth; fracture tough and fibrous. The less esteemed trunk bark is much thicker, deprived of the ash-gray cork, pale cinnamon-brown, the fracture more fibrous, somewhat splintery. The liber separates in thin layers, and the transversely elongated liber bundles are accompanied by axial rows of crystal cells; inodorous, bitter, and astringent.

Constituents. — Tannin, about 12 per cent.; salicin, $C_{13}H_{18}O_7$, 1 to 3 per cent., white bitter scales or needles, insoluble in ether, blood-red by sulphuric acid; by dilute acids split into sugar and saligenin, $C_7H_8O_2$ (solution blue by ferric chloride), or saliretin, $C_{14}H_{14}O_3$. The white or crack willows appear to contain more tannin, the purple willows more salicin. Salicin has also been found in the leaves and flowers of several species of willow, and in the bark and leaves of several species of Populus associated with populin, which is benzoylsalicin.

Properties.— Tonic, astringent, vermifuge, febrifuge. *Dose*, 1 to 4 grams (gr. xv–ʒj) or more. Salicin as a tonic or febrifuge in doses of 0.2 to 1 gram (gr. iij–xv).

HAMAMELIS.—HAMAMELIS, WITCH HAZEL.

Origin.—Hamamélis virginiána, *Linné.* *Natural order*, Hamamelideæ.

Habitat.—North America, in thickets.

Description.—In irregular fragments or curved pieces, 1 or 2 millimeters ($\frac{1}{25}$–$\frac{1}{12}$ inch) thick; outer surface ash-gray, smooth, with scattered small blackish warts, or with short transverse ridges or scars, or somewhat scaly in older bark; the thin gray corky layer easily removed from the pale cinnamon-colored middle bark; inner surface smooth or finely striate; the liber of older bark separating in thin layers; fracture of young bark short, of older bark tough in the bast layer; inodorous; taste astringent, somewhat bitter and pungent.

Constituents.—Tannin 8 per cent.; bitter and pungent principles (not isolated), resin, wax, sugar; ash 6 per cent.

Properties.—Tonic, astringent. *Dose*, 2 to 4 grams (ʒss–j), in infusion or fluid extract.

VIBURNUM.—Viburnum, Black Haw.

Origin.—Vibúrnum prunifólium, *Linné. Natural order*, Caprifoliaceæ, Sambuceæ.

Habitat.—United States, westward to Kansas and Mississippi; in thickets.

Description.—The bark of the stem is in thin pieces or quills, glossy purplish-brown, with scattered warts and minute black dots; collected from old wood grayish-brown; the thin corky layer easily removed from the green layer; inner surface whitish, smooth; fracture short, inodorous, or of a slight valerian-like odor; taste somewhat astringent, bitter. The root bark is reddish-brown, internally cinnamon-colored, very bitter.

Constituents.—Valerianic acid, brown bitter resin, greenish-yellow bitter principle (viburnin), tannin, sugar, oxalates, citrates, malates, and ash 8–9 per cent.

Properties.—Diuretic, tonic, nervine; used in threatened abortion. *Dose*, 2 to 4 grams (ʒss–j), in infusion or fluid extract.

QUERCUS ALBA.—White Oak Bark.

Origin.—Quércus álba, *Linné. Natural order*, Cupuliferæ, Quercineæ.

Habitat.—North America, westward to Minnesota, Kansas, and Mississippi; in woods.

Description.—Nearly flat pieces, deprived of the corky layer, about 6 millimeters (¼ inch) thick, pale brown, inner surface with short, sharp, longitudinal ridges; tough; fracture coarsely fibrous; odor faint tan-like; taste strongly astringent; in the shops usually in an irregular fibrous powder, which does not tinge the saliva yellow.

Constituents.—Tannin, 6–11 per cent. (olive-brown with ferric salts; on sublimation yields needles soluble in alcohol and sparingly in water, colored green by ferric chloride), red-brown coloring matter, pectin, resin, etc. Young oak bark is richer in tannin than bark from old wood. Querco-tannic acid is $C_{28}H_{24}O_{12}$ and $C_{28}H_{28}O_{14}$, the latter being readily soluble in water. Oak red is $C_{28}H_{22}O_{11}$.

Properties.—Astringent. *Dose,* 1 to 4 grams (gr. xv–ʒj); mostly used externally.

QUERCUS TINCTORIA.—BLACK OAK BARK.

Origin.—Quércus coccínea var. tinctória, *Gray.* *Natural order,* Cupuliferæ, Quercineæ.

Habitat.—North America, westward to Minnesota and Texas; in woods.

Description.—Flattish pieces, deprived of the corky layer, about 5 millimeters ($\frac{1}{5}$ inch) thick, reddish-brown, inner surface somewhat ridged; compact but rather brittle; fracture coarsely fibrous; odor faint tan-like; taste strongly astringent and somewhat bitter, imparting a brownish-yellow color to the saliva. Usually kept in an irregular fibrous powder.

In the Southern States the barks of Quércus nígra, *Linné* (black jack), and of Qu. falcáta, *Michaux* (Spanish oak), are frequently used as black oak bark; they are of a much coarser texture and of a deep reddish-brown color.

Constituents.—Tannin 6 to 12 per cent. (blue with ferric salt), red-brown coloring matter, pectin, quercitrin, $C_{36}H_{38}O_{20}$. The latter is yellow, crystalline, nearly tasteless; nearly insoluble in cold water; colored dark yellow by ferric salts, and with dilute acids yields isodulcit, $C_6H_{14}O_6$, and yellow quercetin, $C_{24}H_{16}O_{11}$ (with alcoholic ferric chloride dark green, on boiling deep red).

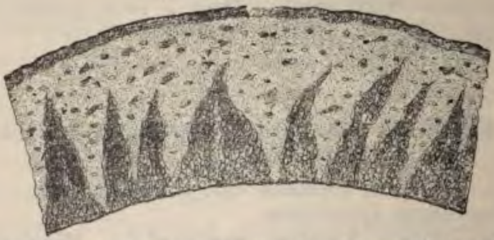
RUBUS.—BLACKBERRY BARK.

Origin. — Rúbus villósus, *Aiton;* Rúbus canadénsis, *Linné;* and Rúbus triviális, *Michaux.* *Natural order,* Rosaceæ, Rubeæ.

Habitat.—North America, in fields and thickets; the last-named species is confined to the Southern States, westward to Texas.

Description.—The bark of the root is collected. Thin, tough, flexible bands, outer surface blackish or blackish-gray, inner surface pale brownish, sometimes with strips of whitish tasteless wood adhering, fracture rather tough and fibrous, the bast fibres in transversely elongated groups, forming rather broad wedges; inodorous, strongly astringent, somewhat bitter.

FIG. 118.



Rubus villosus.—Transverse section of bark, magnified 15 diam.

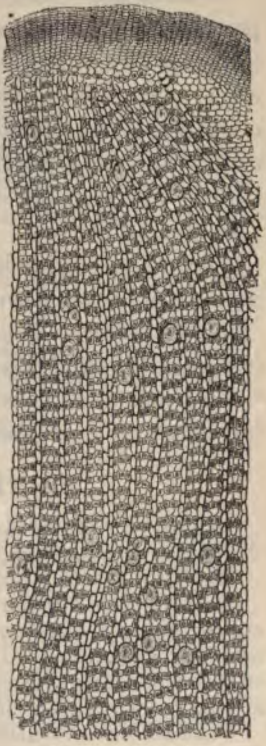
Constituents.—Tannin 10–13 per cent., gallic acid 0.4 per cent., villosin 0.8 per cent., ash 3 per cent., etc. Villosin is a bitter crystalline glucoside, soluble in alcohol, sparingly soluble in water and benzin, insoluble in ether or chloroform; it readily yields villosic acid, which is soluble in alcohol, ether, and chloroform. Both yield with H_2SO_4 and little water deep blue or violet color; with H_2SO_4 and little HNO_3 blood-red color disappearing by water (G. A. Krauss, 1889, 1890).

Properties.—Astringent, tonic. *Dose,* 2 to 8 grams (ʒss–ij), in decoction, syrup, or fluid extract.

GRANATI RADICIS CORTEX.—BARK OF POMEGRANATE ROOT.

Origin.—Púnica Granátum, *Linné.* *Natural order,* Lythrarieæ, Lythreæ.

FIG. 120.



Magnified 40 diam.

Habitat. — India and South-western Asia; cultivated and naturalized in subtropical countries.

Description.—The bark of the root is directed by the U. S., Brit. and French Pharmacopœias. In thin quills or fragments, 5 to 10 centimeters (2 to 4 inches) long, little over 1 millimeter ($\frac{1}{25}$ inch) thick; outer surface brown or brown-gray, somewhat warty or longitudinally and reticulately ridged, the larger pieces with conchoidal scales of cork; inner surface smooth, finely striate, grayish-yellow; fracture short, granular, brownish-yellow, indistinctly radiate in the liber, which contains scattered stone cells and numerous trans-

FIG. 119.

Granati cortex.—Transverse section, magnified 10 diam.

versely and axially packed cells with crystals of calcium oxalate; inodorous, scarcely bitter, astringent.

The bark of the stem is admitted with the root-bark by the German Pharmacopœia; it is similar to the preceding, externally more gray, with longitudinal ridges and with scattered dots or patches of dark-colored lichens; the fracture greenish-yellow, and the bast layer more distinctly radiate; it is said to be equal to the root-bark.

Constituents.—Punico-tannic acid, $C_{20}H_{16}O_{13}$, about 20 per cent., mannit, sugar, gum, pectin, pelletierine, $C_8H_{13}NO$ (colorless oily aromatic alkaloid, soluble in water, alcohol, ether, and chloroform; resinifies on exposure; the salts crystalline), and three allied alkaloids; ash 14 to 16 per cent. The bark from stem and branches contains from 0.35 to 0 61 per cent. of alkaloids, and the root-bark from 1,01 to 1.32 per cent. (Stoeder, 1888.)

Properties.—Anthelmintic, tænifuge. *Dose,* 8 to 16 grams (℥ij–iv), in decoction.

Adulterations.—The barks of Bérberis vulgáris, *Lin.* (see page 185) and Búxus sempervírens, *Linné,* are bitter, not astringent, and yield infusions which are not colored blue-black by ferric salts.

FRAXINUS.—White Ash.

Origin.—Fráxinus americána, *Linné* (Fr. álba, *Marsh*). *Natural order,* Oleaceæ, Fraxineæ.

Habitat.—North America.

Description.—The bark of the root is preferred. Quills or curved pieces about 5 millimeters ($\frac{1}{5}$ inch) thick; cork warty, ash-gray, often removed; whitish or yellowish; inner surface smooth; fracture coarsely fibrous, splintery; odor faintly aromatic, taste bitter, slightly acrid.

Constituents.—Volatile oil, resin, starch, sugar, glucoside (fluorescent with alkalies), crystalline principle, bitter principle, ash 5 to 6 per cent.

Properties.—Diuretic, emmenagogue. *Dose,* 1 gram (gr. xv).

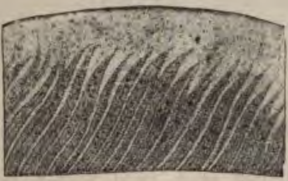
SIMARUBA.—Simaruba.

Origin.—1. Simarúba officinális, *De Candolle;* and, 2. S. medicinális, *Endlicher*. *Natural order*, Simarubeæ.

Habitat.—1. Guiana to Northern Brazil. 2. West Indies.

Description.—The bark of the root is usually collected. Flattish, curved or quilled pieces, often 0.5 to 1 meter (20–40 inches) long, and about 3 millimeters ($\frac{1}{8}$ inch) thick; periderm yellowish or brownish, often partly or wholly removed; then gray-brown; inner surface light brown, striate; bast coarsely fibrous, tough, flexible, difficult to break; bast rays wavy and oblique; inodorous; taste very bitter. No. 2 is light yellowish-brown, the inner surface finely striate.

Fig. 121.



Simaruba.—Transverse section, magnified 3 diam.

Constituents.—Probably quassin or picrasmin, some resin, trace of volatile oil, etc.

Properties.—Tonic, febrifuge. *Dose*, 0.5 to 2 grams (gr. viij–xxx), in infusion or decoction.

QUASSIÆ CORTEX.—Quassia Bark.

Origin.—Picræ'na (Quássia, *Swartz*) excélsa, *Lindley*. *Natural order*, Simarubeæ.

Habitat.—Jamaica.

Description.—Flat or curved pieces, about 5 millimeters ($\frac{1}{5}$ inch) or more thick; outer surface black-gray, longitudinally furrowed and verrucose; inner surface whitish, smooth; bast rays somewhat wavy; fracture in inner layer tough; inodorous, taste very bitter.

The bark of Quássia amára, *Linné*, or Surinam quassia, is about 1 millimeter ($\frac{1}{25}$ inch) thick; externally gray, smoothish; inner surface whitish, smooth; very brittle; fracture smooth.

Constituents.—Picrasmin, alkaloid (?), trace of volatile oil, etc. The bark of Surinam quassia contains quassin.

Properties.—Tonic, febrifuge. *Dose*, 0.5 to 2 grams (gr. viij–xxx), in infusion.

CONDURANGO.—CONDURANGO.

Origin.—Gonólobus Condurángo, *Triana.* *Natural order*, Asclepiadaceæ, Gonolobeæ.

Habitat.—Ecuador.

Description.—Quills or curved pieces about 5 to 10 centimeters (2–4 inches) long; bark about 2 to 6 millimeters ($\frac{1}{12}$–$\frac{1}{4}$ inch) thick, externally brownish or brown-gray, wrinkled and warty; inner surface pale brownish and striate; fracture granular, slightly fibrous, brownish, with scattered latex tubes and brownish yellow groups of stone cells in the wavy bast wedges; the parenchyme contains starch and raphides; nearly inodorous; taste slightly bitter and somewhat acrid. The infusion, prepared with cold water, becomes turbid on heating, but clear again on cooling.

Constituents.—Tannin, a peculiar glucoside (less soluble in hot than in cold water), alkaloid (trace; resembling strychnine in action), resin, starch, gum, etc., ash about 12 per cent.

Properties.—Used in cancer and rheumatism; tonic. *Dose*, 2 grams (gr. xxx).

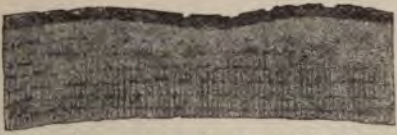
FRANGULA.—FRANGULA.

Origin.—Rhámnus Frángula, *Linné.* *Natural order*, Rhamneæ.

Habitat.—Europe and Northern Asia.

Description.—Quilled, about 1 to 1.5 millimeters ($\frac{1}{25}$–$\frac{1}{16}$ inch) thick; outer surface gray-brown or blackish-brown, with numerous small whitish transversely elongated suberous warts; inner surface smooth, pale brownish-yellow; fracture in the outer layer short, of a purplish tint; in the inner layer fibrous and pale yellow; bast bundles in tangential groups, accompanied by axial rows of cells containing crystals; nearly inodorous; taste mucilaginous, sweetish, and bitter. On mastication it colors the saliva yellow. Immersed in diluted alkali solution, its inner surface is colored red. The reddish infusion is colored dark brown by ferric chloride. The bark should not be used sooner than a year after it has been collected.

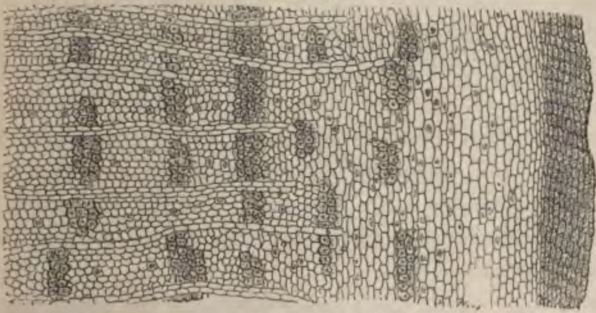
FIG. 122.



Frangula.—Transverse section, magnified 10 diam.

Constituents.—Frangulin or rhamnoxanthin, $C_{22}H_{22}O_9$, or $C_{20}H_{20}O_{10}$, about 0.04 per cent. (yellow glucoside, tasteless, sublimable, purple by alkalies; yields yellow needles of frangulic acid or isoemodin), emodin, $C_{15}H_{10}O_5$, about 0.1 per cent. (reddish), isoemodin, $C_{15}H_8O_4$ (bitter and laxative), resin, tannin, ash 5–6 per cent. Fresh frangula bark contains neither frangulin nor emodin.

FIG. 123.



Frangula.—Magnified 80 diam.

Properties.—When fresh, emetic; when old, tonic, purgative, diuretic. *Dose*, 2 to 8 grams (ʒss–ij), in decoction.

RHAMNUS PURSHIANA.—Cascara Sagrada, Chittem Bark.

Origin.—Rhámnus Purshiána, *De Candolle.* *Natural order*, Rhamneæ.

Habitat.—Northern Idaho, and westward to the Pacific coast.

Description.—Curved or quilled, usually about 10 centimeters (4 inches) long, 1 or 2 to 4 millimeters ($\frac{1}{25}$—$\frac{1}{12}$—$\frac{1}{6}$ inch) thick; periderm brownish-gray and whitish, with numerous rather broad pale-colored corky warts, and often with patches of lichens, otherwise smooth; underneath brown or reddish-brown; inner surface yellowish or brownish, smooth or finely striate; fracture short, yellowish, in the inner layer of the thick pieces somewhat fibrous; medullary rays narrow; bast bundles in tangential groups; stone cells in the outer bark in clusters; inodorous, taste bitter.

Rhámnus califórnica, *Eschscholtz*, from central California southward, is locally also known as cascara sagrada. The bark resembles the preceding, but is rather thinner, the color somewhat reddish dull-gray, the corky warts less numerous and disappearing rather early, the bast rays somewhat broader with the bast bundles sometimes in pairs, and the inner surface distinctly striate from the depressed medullary rays.

Both these barks when masticated color the saliva yellow and resemble also frangula bark in their behavior to alkali and ferric chloride.

Constituents.—Tannin, white sublimable principle, yellow crystalline principle (resembling frangulin, but probably not identical with it), and three resins (one is colored brown by potassa, another purple by the same reagent, and the third red-brown by sulphuric acid). The composition probably changes on keeping; 0.05 per cent. emodin was found in bark about a year old (Schwabe, 1888).

Properties.—Tonic, febrifuge, purgative. *Dose*, 1 to 4 grams (gr. xv–ʒj), in decoction, tincture, or fluid extract.

PISCIDIA.—JAMAICA DOGWOOD.

Origin.—Piscídia Erythrína, *Jacquin.* *Natural order*, Leguminosæ, Papilionaceæ, Dalbergieæ.

Habitat.—West Indies.

Description.—In quills or curved pieces, 5 to 15 centimeters (2–6 inches) long, about 4 or sometimes 6 millimeters (⅙ or ¼ inch) thick, externally orange-brown or dark gray-brown, with thin longitudinal and transverse ridges, roughish wrinkled, somewhat fissured; inner surface brownish, smooth or fibrous; fracture tough, fibrous, with blue-green or brownish-green patches; bast fibres in tangentially elongated bundles, arranged in radial rows, attached to cells containing crystals of calcium oxalate and imbedded in parenchyme; odor narcotic, opium-like; taste bitter, somewhat acrid.

Constituents.—Resin, fat, piscidin (crystallizable, insoluble in water, slightly soluble in cold alcohol, soluble in chloroform and benzol), and a bitter glucoside soluble in water.

Properties.—Sudorific, soporific. *Dose*, 1 to 3 grams (gr. xv–xlv).

JUGLANS.—BUTTERNUT.

Origin.—Júglans cinérea, *Linné.* *Natural order*, Juglandeæ.

Habitat.—North America.

Description.—The inner bark of the root is collected in autumn. Flat or curved pieces, 3 to 6 millimeters (⅛ to ¼ inch) thick, outer surface nearly free from soft cork, deep brown; inner surface smooth and striate; transverse fracture short, delicately checkered from whitish parenchyme and transverse groups of brown bast fibres; odor feeble; taste bitter, somewhat acrid.

Constituents.—Nucin (juglandic acid, juglone), $C_{10}H_6O_3$ (orange-yellow needles, acrid, purple by alkalies, volatile with water vapors, decomposed by long boiling), fixed oil 14 per cent., trace of volatile oil and tannin.

Properties.—Cathartic, tonic. *Dose,* 4 to 8 grams (ʒj–ij), in infusion or extract.

QUEBRACHO.—QUEBRACHO.

Quebracho blanco.

Origin.—Aspidospérma Quebrácho, *Schlechtendal.* *Natural order,* Apocynaceæ, Plumerieæ.

Habitat.—Argentine Republic.

Description.—Nearly flat pieces, 1 to 3 centimeters ($\frac{2}{5}$–1$\frac{1}{5}$ inches) thick; cork deeply fissured, gray or yellowish-gray and internally reddish-brown; inner surface yellowish or brown and striate; hard, fracture granular in the outer layer, showing wavy strata of cork and parenchyme, and short splintery in the yellowish or brown bast layer; the parenchyme with numerous whitish groups of stone cells; the bast fibres dark colored, scattered, and accompanied by axial rows of stone cells; medullary rays in about three rows of cells; small starch grains in the parenchyme; nearly inodorous; taste very bitter, slightly aromatic.

Constituents.—Six alkaloids, viz., aspidospermine, quebrachine, quebrachamine, aspidospermatine, aspidosamine, and hydroquebrachine, the two last amorphous; a peculiar sugar, quebrachit; tannin 3–4 per cent.

Properties.—Tonic, antispasmodic in asthma, etc. *Dose,* 1 to 4 grams (gr. xv–ʒj).

Quebracho colorado (Loxoptery′gium Loréntzii, *Grisebach. Natural order,* Anacardiaceæ. Bark neatly checkered from tangential bands of dark-colored cork and groups of bast fibres, and from radial light-colored medullary rays. Wood, red-brown, contains 20 per cent. of tannin; also loxopterygine.

AZEDARACH.—AZEDARACH.

Origin.—Mélia Azédarach, *Linné.* *Natural order,* Meliaceæ, Melieæ.

Habitat.—China and India, cultivated in the Southern United States.

Description.—The bark of the root is collected. Curved pieces or quills of variable size and thickness, outer surface red-brown, with irregular blackish longitudinal ridges; inner surface whitish or brownish, longitudinally striate; fracture more or less fibrous; upon transverse section tangentially striate, with yellowish bast fibres; inodorous, sweetish, afterward bitter and nauseous.

If collected from old roots, the bark must be freed from the thick rust-brown, nearly tasteless corky layer.

Constituents.—Bitter yellowish-white resin, soluble in alcohol, ether, and chloroform; no tannin.

Properties.—Anthelmintic, emetic, poisonous. *Dose,* 1 to 4 grams (gr. xv–ʒj), in decoction.

XANTHOXYLUM.—Prickly Ash.

Origin.—Xanthóxylum (Zanthóxylum) fraxíneum, *Willdenow* (X. americánum, *Miller*) (Northern prickly ash), and X. caroliniánum, *Lamarck* (X. Cláva-Hérculis, *Linné*) (Southern prickly ash). *Natural order,* Rutaceæ, Xanthoxyleæ.

Habitat.—North America; the first species in rocky woods in the Northern and Central States; the second species not far from the coast, Southern Virginia to Eastern Texas.

Description.—Northern prickly ash is in curved or quilled fragments, about 1 millimeter ($\frac{1}{25}$ inch) thick, outer surface brown-gray with whitish patches and minute black dots, faintly furrowed, with some brown, glossy, straight, two-edged spines, linear at the base, and about 6 millimeters ($\frac{1}{4}$ inch) long; inner surface whitish, smooth; fracture short, non-fibrous, green in the outer and yellowish in the inner layer; inodorous, bitterish, very pungent. Southern prickly ash resembles this, but is nearly 2 millimeters ($\frac{1}{12}$

inch) thick, and is marked by many conical corky projections, sometimes 2 centimeters ($\frac{4}{5}$ inch) high, and by stout brown spines, rising from a corky base.

Prickly ash should not be confounded with the bark of Arália spinósa, *Linné*, which is nearly smooth externally, but the stembark beset with slender prickles in transverse rows.

Constituents.—Acrid green oil, resin (crystalline, white, tasteless, in alcoholic solution bitter; the principles from the two barks are similar in behavior, but not identical), soft resin (acrid), bitter principle (probably an alkaloid, brown and dark red with sulphuric acid), little tannin, sugar, ash 11 to 12 per cent.

Properties.—Sialagogue, stimulant, alterative, emmenagogue. *Dose,* 0.5 to 1 gram (gr. viij–xv), in powder or tincture; large doses in decoction.

MYRICA.—BAYBERRY BARK.

Origin.—Myríca cerífera, *Linné.* *Natural order,* Myricaceæ.

Habitat.—North America.

Description.—Quills or curved pieces, about 1.5 millimeters $\frac{1}{16}$ inch) thick; externally whitish or grayish, scaly; underneath the thin suberous layer smooth, red-brown; inner surface red-brown, faintly striate; fracture reddish, granular, slightly fibrous; odor somewhat aromatic; taste astringent, bitter, pungently acrid.

Constituents.—Acrid resin, myricinic acid (resembling saponin, acrid, frothing with water), little volatile oil, tannin, etc.

Properties.—Acrid stimulant, sialagogue, errhine. *Dose,* 0.3 to 0.6 gram (gr. v–x).

ERYTHROPHLŒUM.—SASSY BARK.

Origin.—Erythrophlœ'um guineénse, *Don.* *Natural order,* Leguminosæ, Cæsalpinieæ, Dimorphandreæ.

Habitat.—Western and Central Africa.

Description.—Flat or curved, about 5 millimeters ($\frac{1}{5}$ inch) thick; externally warty, fissured, red-brown, hard; fracture coarsely granular and fibrous, inodorous, astringent, bitter, and acrid.

Constituents.—Erythrophleine (heart tonic, said to possess anæsthetic action), tannin, coloring matter.

Properties.—Astringent, diaphoretic, narcotic.

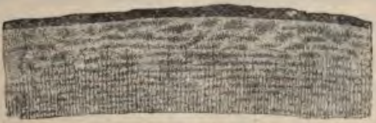
MEZEREUM.—MEZEREON.

Origin.—Dáphne Mezéreum (Mezeréum), *Linné*, and other species of Daphne. *Natural order*, Thymelaceæ, Euthymelæeæ.

Habitat.—Europe, in mountainous regions, eastward to Siberia; spontaneous in Canada and New England.

Description.—Long, thin bands, folded or rolled into disks; outer surface yellowish or brown-yellow, with transverse scars and minute blackish dots; underneath the thin cork is a thin parenchyme layer of light greenish color; inner surface whitish, silky; bast in irregular transverse layers, very tough; inodorous, very acrid.

Fig. 124.



Mezereum.—Transverse section, magnified 15 diam.

Dáphne Lauréola, *Linné*, and D. Gnídium, *Linné*, of Southern Europe, yield similar barks.

Constituents.—Soft acrid resin and oil; daphnin, $C_{15}H_{16}O_9$ (bitter glucoside, insoluble in ether, soluble in alkalies with a yellow color, blue by ferric salts), the acrid principle has been named mezerein.

Properties.—Sialagogue, stimulant, diuretic, alterative; externally vesicant. *Dose*, 0.1 to 0.4 gram (gr. jss–vj), mostly combined with other drugs.

GOSSYPII RADICIS CORTEX.—BARK OF COTTON ROOT.

Origin.—Gossy′pium herbáceum, *Linné*, and other species of Gossypium. *Natural order*, Malvaceæ, Malveæ.

Habitat.—Subtropical Asia and Africa, cultivated in the United States.

Description.—The bark of the root is collected. Thin, flexible bands or quilled pieces; outer surface brownish-yellow, with slight longitudinal ridges or meshes, small black circular dots or short transverse lines, and, from the abrasion of the thin cork, with dull brownish-orange patches; inner surface whitish, of a silky lustre, finely striate; bast fibres long, tough, separable in papery layers; inodorous; taste very slightly acrid and faintly astringent.

Constituents.—In the fresh bark a yellow chromogene, becoming red and resinous; yellow resin, fixed oil, little tannin, sugar, starch, etc.

Properties.—Emmenagogue, oxytocic. *Dose*, 2 to 4 grams (ʒss–j), in decoction or fluid extract.

COTO.—COTO BARK.

Origin.—Unknown, possibly from *natural order* Laurineæ or Anacardiaceæ.

Habitat.—Bolivia.

Description.—Flat or curved, mostly deprived of cork, about 5 to 15 millimeters ($\frac{1}{5}$–$\frac{3}{5}$ inch) thick; outer surface cinnamon-brown, smooth; inner surface darker brown; fracture granular in the outer layer, tenacious and fibrous in the inner layer, with numerous yellow groups of stone cells and bast fibres; odor aromatic, cinnamon-like; taste pungent, slightly bitter.

Another coto (paracoto) bark, likewise from Bolivia, is usually about 10 to 20 millimeters ($\frac{2}{5}$–$\frac{4}{5}$ inch) thick; sometimes with whitish fissured cork; odor fainter, nutmeg-like.

The bark of Drímys Wintéri, *Forster*, var. granaténsis, *Eichler*, is said to have been offered as coto bark from Venezuela.

Constituents.—Cotoin, $C_{22}H_{18}O_6$ (pale yellow, very acrid, soluble in alkalies, sparingly soluble in water), in coto bark. Paracotoin (pale yellow, tasteless); leucotin, hydrocotoin, etc., in paracoto bark. Both barks contain volatile oil, resin, and piperonylic acid, $C_8H_6O_4$; no tannin.

Properties.—Useful in diarrhœa. *Dose*, 0.3 to 0.6 gram (gr. v–x), in powder or tincture. *Dose*, of cotoin 0.05 to 0.10 gram (¾–1½ gr.), of paracotoin 0.1 to 0.2 gram (gr. jss–iij).

EUONYMUS.—WAHOO.

Origin.—Euónymus atropurpúreus, *Jacquin. Natural order*, Celastrineæ.

Habitat.—United States, southward to Florida, and westward to Wisconsin, in shady woods.

Description.—Quilled or curved pieces, about 2 millimeters ($\frac{1}{12}$ inch) thick; outer surface ash-gray with blackish ridges or patches, detached in thin and small scales; inner surface whitish or slightly tawny, smooth; fracture smooth, whitish, the inner layers tangentially striate; nearly inodorous; taste sweetish, somewhat bitter, and acrid.

Constituents.—Euonymin (very bitter, amorphous, soluble in alcohol and water), atropurpurin (crystalline glucoside), bitter extractive, pungent principle, citric, tartaric, and malic acids, resins, fixed oil, free fat acid, wax, starch, pectin, ash 14 to 15 per cent. (Wenzell, 1862; Naylor and Chaplin, 1889). Commercial euonymin is usually the extract or powdered extract.

Properties.—Tonic, diuretic, laxative, antiperiodic. *Dose*, 2 to 4 grams (ʒss–j), in decoction or fluid extract.

QUILLAIA.—QUILLAIA. SOAPBARK.

Origin.—Quillaía (Quilláia) Saponária, *Molina. Natural order*, Rosaceæ, Quillajeæ.

Habitat.—Chili and Peru.

Description.—The bark is deprived of the brown periderm. Flat large pieces, about 5 millimeters ($\frac{1}{5}$ inch) thick, pale brownish-white, and smooth on both sides, or the outer surface with small patches of red-brown cork; tough; fracture splintery; transverse section checkered, with tangentially arranged pale brownish bast fibres, white bast parenchyme, and distinct white medullary rays about 5 cells in width; the tissue contains small starch grains and a large quantity of acicular crystals of calcium oxalate; inodorous, very acrid, sternutatory.

Constituents.—Saponin, about 9 per cent., a little starch, gum, salts, etc. This saponin is a mixture of the two glucosides quillaic acid, $C_{19}H_{30}O_{10}$ (soluble in cold absolute alcohol, precipitated by lead acetates), and quillaia-sapotoxin, $C_{17}H_{26}O_{10}$ (neutral, nearly insoluble in absolute alcohol, not precipitated by normal lead acetate) (Kobert, 1887).

Properties. — Stimulant, diuretic, irritant, detergent. *Dose,* 1 to 2 grams (gr. xv–xxx), in infusion.

ULMUS.—SLIPPERY ELM.

Origin.—Úlmus fúlva, *Michaux.* *Natural order,* Urticaceæ, Ulmeæ.

Habitat. — North America, west to Louisiana and Nebraska, in woods.

Description.—The bark is deprived of the brown periderm. Flat pieces varying in length and width, about 3 millimeters ($\frac{1}{8}$ inch) thick, tough, pale brownish-white, the inner surface finely ridged; fracture fibrous and mealy, the transverse section delicately checkered; odor slight, fenugreek-like, taste mucilaginous, insipid.

European Elm bark from Úlmus campéstris, *Linné*, and

U. effúsa, *Willdenow,* is cinnamon-colored, nearly inodorous, and of a mucilaginous, bitterish, and astringent taste.

Constituents.—Mucilage; in European Elm bark also a little tannin and bitter principle. Ground elm bark is sometimes adulterated with corn meal and other starchy materials.

Properties.—Demulcent, emollient. *Dose,* 8 grams (ʒij) or more, mostly used externally.

CINNAMOMUM.—CINNAMON. CEYLON CINNAMON.

Origin.—Cinnamómum zeylánicum, *Breyne.* *Natural order,* Laurineæ, Perseaceæ.

Habitat.—Ceylon; cultivated.

Description.—The outer bark has been removed by scraping. In long closely rolled quills, composed of 8 or more layers of bark of the thickness of paper; pale yellowish-brown; outer surface smooth, formed by a layer of stone cells, and marked with wavy lines of bast bundles; inner surface scarcely striate; fracture short-splintery; the parenchyme contains starch and reddish-brown coloring matter, scattered oil cells and larger cells with mucilage; odor fragrant; taste sweet and warmly aromatic.

CINNAMOMUM CASSIA.—CINNAMON CASSIA. CHINESE CINNAMON.

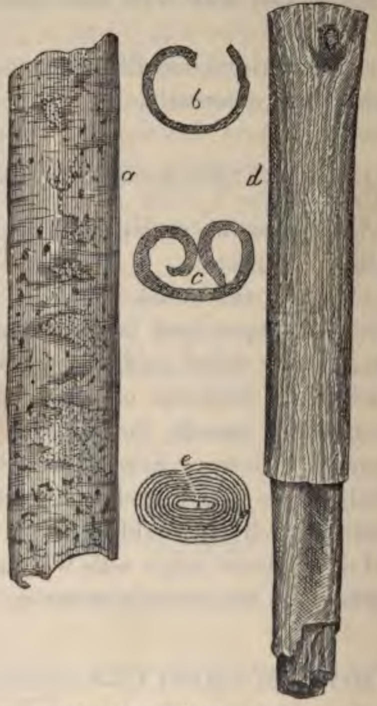
Origin.—Cinnamómum Cássia, *Blume,* and other species of Cinnamomum. *Natural order,* Laurineæ, Perseaceæ.

Habitat.—China.

Description.—Nearly deprived of the corky layer, 1 millimeter ($\frac{1}{25}$ inch) or more in thickness; yellowish-brown; more or less quilled; fracture nearly smooth; odor and taste analogous to those of cinnamon, but less delicate.

The tissue resembles that of Ceylon cinnamon, but has the stone cells in irregular groups, and contains fewer bast-fibres and more mucilage cells.

FIG. 125.



Cinnamon.—*a, b, c.* From China. *d, e.* From Ceylon.

Cassia lignea is either Chinese cinnamon, or a thicker, less fragrant, and more mucilaginous bark.

Saigon cinnamon from China is quilled, unscraped, sweet and fragrant.

Constituents.—Volatile oil ($\frac{1}{2}$ to $1\frac{1}{2}$ per cent.), tannin, sugar, mannit, mucilage, ash about 2 to 5 per cent. Oil of cinnamon has the spec. grav. 1.035–1.055 or 1.065, is readily soluble in alcohol, and consists of a hydrocarbon, cinnamyl acetate, and of cinnamic aldehyd, C_9H_8O (75 to 90 per cent.), which oxidizes to cinnamic acid, $C_9H_8O_2$. The oil of Ceylon cinnamon is most fragrant.

Properties.—Carminative, stimulant, astringent. *Dose,* 0.5 to 2 grams (gr. viij–xxx), in powder, tincture, or infusion.

SASSAFRAS.—SASSAFRAS.

Origin.—Sássafras officinále, *Nees.* *Natural order,* Laurineæ, Litseaceæ.

Habitat.—North America, from Eastern Texas and Kansas eastward to Florida and Ontario; in woods.

Description.—The bark of the root is collected and deprived of the gray corky layer; irregular fragments, about 3 millimeters (⅛ inch) thick, bright rust-brown, soft, brittle, with a short corky fracture showing numerous oil cells, several suberous bands, and in the inner layer lighter colored medullary rays and few bast fibres; strongly fragrant, sweetish, aromatic, somewhat astringent.

Constituents.—Volatile oil (about 5 per cent.), tannin, sassafrid, starch, gum, resin, wax. Oil of sassafras has the spec. grav. 1.090, dissolves readily in alcohol, and yields with nitric acid a dark red resin—it consists of safrene, $C_{10}H_{16}$, and safrol, $C_{10}H_{10}O_2$; the latter melts at 8.5° C. (47.3° F.).

Properties.—Stimulant, diaphoretic, alterative. *Dose,* 2 to 4 grams (ʒss–j), in infusion; mostly used as a flavor.

CANELLA.—CANELLA.

Origin.—Canélla álba, *Murray.* *Natural order,* Canellaceæ.

Habitat.—West Indies.

Description.—In quills or broken pieces about 3 millimeters (⅛ inch) thick; almost completely deprived of the gray suberous layer; external surface pale orange-red, with transversely elongated cork scars and shallow whitish depressions; inner surface white, finely striate; fracture short, granular, white, with numerous orange-yellow resin cells, and in the inner layer brownish; odor cinnamon-like; taste bitterish, biting.

Constituents.—Volatile oil 1 per cent. (contains eugenol), resin, bitter principle, mannit about 8 per cent., mucilage, starch, albumin; free from tannin.

Properties.—Tonic, stimulant. *Dose*, 0.5 to 2 grams (gr. viij–xxx), in powder and as an addition to tinctures.

CINNAMODENDRON.—FALSE WINTER'S BARK.

Origin.—Cinnamodéndron corticósum, *Miers.* *Natural order*, Canellaceæ.

Habitat.—Jamaica.

Description.—Curved or quilled, about 3 millimeters ($\frac{1}{8}$ inch) thick; deprived of the dark brown corky layer; outer surface smooth, light brown, with red-brown, roundish or transversely elongated scars; inner surface pale brown, finely striate; fracture short, granular, whitish and brownish, with numerous dark brown resin cells, and in the inner layer brown; odor cinnamon-like; taste bitterish, biting.

Constituents.—Probably like Canella.

Properties and Uses.—Like Canella.

WINTERA.—WINTER'S BARK.

Origin.—Drímys Wintéri, *Forster.* *Natural order*, Magnoliaceæ, Intereæ.

Habitat.—Western part of South America.

Description.—Quilled or curved, 2 to 8 millimeters ($\frac{1}{12}$ to $\frac{1}{3}$ inch) thick; outer surface gray and smooth, or rust-brown, and wrinkled; inner surface brown, coarsely striate or ridged; fracture granular, brown, with whitish groups of stone cells and yellow resin cells; odor peculiar, aromatic; taste very pungent, astringent.

Constituents.—Volatile oil (containing winterene, $C_{15}H_{24}$), tannin, pungent resin, starch.

Properties.—Tonic, stimulant, antiscorbutic. *Dose*, 0.5 to 2 grams (gr. viij–xxx), in powder or tincture.

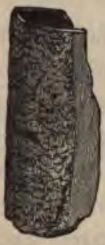
ANGUSTURA.—ANGUSTURA.

Origin.—Galipéa Cuspária, *St. Hilaire* (Gal. officinális, *Hancock;* Cuspária trifoliáta, *Engler*). *Natural order*, Rutaceæ, Cusparieæ.

Habitat.—Northern South America.

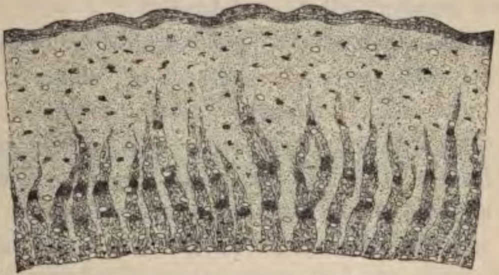
Description.—Flat, curved, or quilled, 2 to 3 millimeters ($\frac{1}{12}$ to $\frac{1}{8}$ inch) thick; periderm ochrey-gray, friable, often partly or wholly absent, and the outer surface then reddish-brown; inner surface light cinnamon-brown, smooth; fracture smooth, resinous, reddish-brown, with scattered darker oil-cells and glistening white striæ (crystals of calcium oxalate); odor aromatic; taste aromatic, very bitter.

FIG. 126.



Angustura bark, about one-half natural size.

FIG 127.



Transverse section, magnified 10 diam.

Constituents.—Volatile oil ½ to 1½ per cent., angusturin, four alkaloids, a glucoside, resins, gum, ash 8 per cent. Angusturin has a bitter taste, is insoluble in ether, soluble in alcohol and water, precipitated by tannin. A fluorescent glucoside is insoluble in ether and alcohol. The four alkaloids are white and crystallize from petroleum benzin; the salts of galipine and galipidine are yellow or yellowish, those of cusparidine and cusparine white, and the latter sparingly soluble in water (Beckurts and Nehring, 1891).

Properties.—Stimulant, tonic, febrifuge. *Dose*, 0.5 to 2 grams (gr. viij–xxx), in powder, infusion, or tincture.

Substitutions.—Esenbéckia febrífuga, *Martius* (Rutaceæ), so-called Brazilian angustura. Bark externally brown-gray or with light rust-brown patches, internally dark brown;

fracture short fibrous; taste bitter, not aromatic. Contains evodine or esenbeckine (yellowish-green by H_2SO_4).

Stry'chnos Nux vómica, *Linné*, (Loganiaceæ), so-called false angustura bark. Externally gray with whitish warts and bright rust colored patches; inner surface brown; fracture granular, smooth, of a brown color, showing one or occasionally two yellowish tangential layers of stone cells, but no short white striæ; taste strongly bitter, not aromatic. Contains strychnine and brucine.

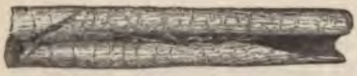
CASCARILLA.—CASCARILLA.

Origin.—Cróton Elutéria, *Bennett.* *Natural order*, Euphorbiaceæ, Crotoneæ.

Habitat.—Bahama Islands.

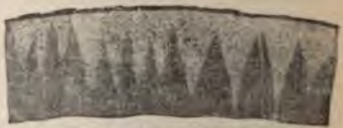
Description.—In broken quills or curved pieces, rarely 10 centimeters (4 inches) long, about 2 millimeters ($\frac{1}{12}$ inch) thick, having a grayish, somewhat fissured, easily detached corky layer, with chalky white patches of a thin lichen and black dots; the remaining tissue dull brown, and the inner surface smooth; fracture short, resinous, radially striate; the parenchyme contains starch, and in scattered cells either oil, brown coloring-matter, or crystals; bast fibres few; when burned emits a strong aromatic somewhat musk-like odor; taste warm and very bitter.

Fig. 128.



Cascarilla; quill.

Fig. 129.



Cascarilla.—Transverse section, magnified 5 diam.

Constituents.—Volatile oil 1.5 per cent., cascarillin (bitter needles, soluble in alcohol, ether, and hot water), resin 15 per cent., little tannin, pectin, gum, starch.

Properties.—Stimulant, tonic, febrifuge, in large doses nauseating. *Dose*, 1 to 2 grams (gr. xv–xxx), in infusion or tincture.

Allied Drugs.—Copalchi bark, from Cróton Pseudochína, *Schlechtendal*, Mexico. Large quills; periderm whitish or gray, not fissured; inner surface cinnamon-brown, smooth; fracture granular, in inner layer finely fibrous; odor and taste similar to Cascarilla.

Malambo bark, from Cróton Malámbo, *Karsten*, Venezuela. Large quills, resembling the preceding, the thin cork warty, longitudinally fissured, and easily removed; fracture in inner layer coarsely fibrous.

Other barks from different species of Croton are not unfrequently sold for Copalchi and Malambo bark.

6. LEAVES AND LEAFLETS.—FOLIA ET FOLIOLA.

Leaves grow laterally from the stem, and are attached thereto either by the blade, in which case they are sessile, or they are petiolate, raised upon a foot-stalk. A leaf is called simple if it has only one blade, and compound if it has two or more distinct blades on a common leaf-stalk. The separate blades of compound leaves are termed leaflets, and, if they are articulated with the common leaf-stalk, they are, after collection and drying, usually detached from the latter, and cannot then be distinguished from simple leaves. The veins of a leaf may run parallel from the base to the apex, or from the mid-rib to the margin; or they may branch and divide in various ways and anastomose, forming a network. Parallel-veined leaves are met with in most monocotyledonous plants, while the dicotyledons have only netted-veined leaves, with the exception of the so-called phyllodia, which are foliaceous petioles. Most leaves are more or less hairy, at least while young; in fully matured leaves, which are otherwise smooth, hairs sometimes remain on the lower surface, and particularly along the veins. Hairs may consist of a single or of several cells; sometimes they terminate in oil-bearing glands, as in the leaves of the labiatæ. The hairy covering modifies, to some extent, the green color of the surface. The color of the upper surface is, as a rule, darker green, owing to the compact nature of the tissue on that side. Occasionally the surface of leaves becomes coated with a wax-like exudation. Deciduous leaves, which last only for a single season, are rarely leathery; but sempervirent leaves, lasting for more than one season, are generally of a leathery texture. All the officinal leaves are derived from dicotyledons.

Histology.—The petiole or foot-stalk consists mainly of fibrovascular tissue, which, on entering the blade, branches so as to form the ribs and veins or framework of the leaf, the spaces between which are filled with parenchyme (mesophyll). Under the epidermis of the upper side of expanded leaves is found a layer consisting of one or more rows of vertically elongated, compacted parenchyme cells (palisade cells). A few of the officinal leaves, like senna, have also a small palisade layer beneath the epidermis of the lower surface, and in the falcate eucalyptus leaves nearly the entire mesophyll consists of palisade cells. The parenchyme between this layer and the lower surface is loosely arranged, leaving irregular air-spaces between the horizontally elongated cells. The parenchyme contains the chlorophyll, likewise the oil-glands, if present, which usually give the leaves a pellucid-punctate appearance; and in the same tissue originates the suberous growth which appears upon certain leaves in the form of circular or roundish disks. On the lower surface, and in some leaves also on the upper surface, are found the stomata or breathing-pores.

Classification.

I. Margin entire.

1. Aromatic and glandular; all coriaceous except Thymus.

Linear, revolute, woolly beneath, green above.	Rosmarinus.
Linear, revolute, pubescent beneath, grayish-green.	Thymus.
Broad oval, obtuse, rough on both sides.	Boldus.
Oval-oblong, retuse, uneven at base.	Pilocarpus.
Lance-oblong, acute at both ends.	Laurus.
Falcate-lanceolate, pointed, uneven at base.	Eucalyptus.
Oval-lanceolate or elliptic, smooth, delicately wrinkled.	Chekan.
Elliptic, smooth, reticulate above.	Myrcia.
Oval-oblong, smooth, petiole winged.	Aurantium.

2. Not aromatic or glandular; coriaceous.

Linear-lanceolate, somewhat revolute, smooth.	Oleander.
Elliptic-oblong, revolute, rusty-woolly beneath, aromatic when bruised.	Ledum.
Obovate, somewhat revolute, smooth.	Uva ursi.
Ovate-oblong, rather acute, pale green.	Arctostaphylos glauca.
Roundish cordate, bristly.	Epigæa.
Elliptic, acute at both ends, smooth.	Kalmia.

3. Not aromatic or coriaceous.

Obovate, mucronulate, uneven at base, nearly smooth.	Senna (baladi).
Lance-oval, acute, uneven at base, nearly smooth.	Senna alexandrina.
Lanceolate, acute, uneven at base, nearly smooth.	Senna indica.
Ovate-oblong, obtuse, uneven at base, nearly smooth.	Cassia marilandica.
Lance-oblong, pointed, sometimes with a few teeth or three-lobed.	Sesamum.
Obovate-oblong, acute at base, near the mid-rib with two folds.	Erythroxylon.

Ovate-oblong, acute, papery and smooth, upper side mostly brownish.	Belladonna.
Oval-lanceolate, acute below, smooth.	Duboisia.
Ovate-lanceolate, acute, papery, hairy, brown on both sides.	Tabacum.
II. Margin toothed or crenate.	
1. Not coriaceous.	
Ovate, uneven at base, angular-toothed, papery, smooth.	Stramonium.
Ovate-oblong, gray-green, hairy, the teeth large and triangular.	Hyoscyamus.
Ovate, obtuse, crenate, beneath with white reticulations.	Digitalis.
Lanceolate, finely crenulate, beneath with brown reticulations.	Matico.
Ovate-oblong, finely crenulate, gray-green, soft hairy beneath.	Salvia.
Oval-obovate, obliquely heart-shaped, wavy toothed.	Hamamelis.
Oval, acute at both ends, irregularly toothed, smooth.	Thea.
Lance-oblong, rather obtuse; teeth distant.	Ilex paraguayensis.
Obovate or lance-obovate, rather obtuse; teeth few.	Turnera.
Oblong-lanceolate, acuminate, sinuate serrate, smooth, feather-veined.	Castanea.
Lanceolate, pointed, closely serrate, smooth.	Persica.
Lance-oblong, with few teeth, mostly entire (see above).	Sesamum.
Roundish heart-shaped, angular, white tomentose beneath.	Tussilago.
2. Coriaceous.	
Oval, spiny-wavy toothed.	Ilex opaca.
Oblanceolate, sharply serrate above, green, and smooth.	Chimaphila.
Lanceolate, serrate, on upper surface a whitish spot.	Chimaphila maculata.
Roundish oval, mucronate, with appressed teeth, smooth.	Gaultheria.
Oblong, serrate, with depressed glands near base of mid-rib.	Laurocerasus.

Oval, obovate, or roundish, crenate or serrate, gland in each sinus.	Buchu (short).
Linear-lanceolate, rather thin, glandular like preceding.	Buchu (long).
Elliptic-lanceolate, dentate, varnished above, white and reticulate beneath.	Eriodictyon.
III. Margin lobed; subcoriaceous.	
Linear-lanceolate, lobes alternate, roundish.	Comptonia.
Kidney-shaped, three-lobed, lobes entire.	Hepatica.
Suborbicular, the divisions linear-lanceolate and furrowed above.	Aconitum.
IV. Leaves ternate.	
Leaflets sessile, obovate oblong, slightly crenate.	Menyanthes.
Lateral leaflets sessile, obliquely ovate; all entire or notched.	Toxicodendron.
V. Leaves bi- or tri-pinnate.	
Pinæn subcoriaceous, spatulate, nearly entire, pellucid-punctate.	Ruta.
Pinnæ thin, oblong-lanceolate, pointedly toothed.	Conium.

ROSMARINUS.—ROSEMARY.

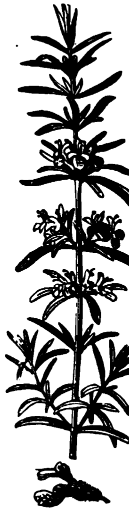
Origin. — Rosmarínus officinális, *Linné. Natural order*, Labiatæ, Monardeæ.

Habitat.—Basin of the Mediterranean; cultivated.

Description.—Rigid, linear, about 25 millimeters (1 inch) long, entire, revolute, dark green above, woolly and glandular and with a prominent midrib beneath; pungently aromatic, somewhat camphoraceous, and bitter.

Constituents.—Volatile oil about 1 per cent., resin, tannin, bitter principle. The volatile oil is yellowish, spec. grav. 0.90, readily soluble in

FIG. 130.



Rosmarinus officinalis, *Linné*.—Branch and flower.

alcohol, contains the hydrocarbon cineol, $C_{10}H_{16}$, and the compounds, $C_{10}H_{16}O$ and $C_{10}H_{18}O$.

Properties.—Carminative, stimulant, diuretic, emmenagogue, diaphoretic. *Dose,* 0.2 to 1 gram (gr. iij–xv), in infusion.

THYMUS.—GARDEN THYME.

Origin.—Thy'mus vulgáris, *Linné.* *Natural order,* Labiatæ, Satureineæ.

Habitat.—Southern Europe; cultivated.

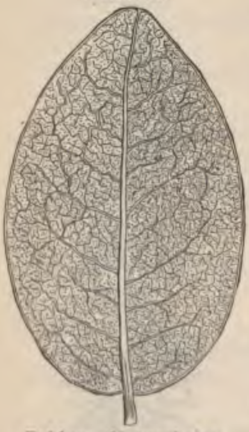
Description.—Linear or narrow oblong, 5 to 10 millimeters ($\frac{1}{5}$–$\frac{2}{5}$ inch) long, revolute, grayish-green, glandular punctate on both sides, grayish pubescent beneath; aromatic; taste spicy. The expanded leaves are ovate or lanceolate.

Constituents.—Volatile oil about 2½ per cent., spec. grav. 0.89, readily soluble in alcohol, consists of cymene, $C_{10}H_{14}$, thymene, $C_{10}H_{16}$, and thymol, $C_{10}H_{14}O$; the latter melts at 50° C. (122° F.), and liquefies in contact with camphor.

Properties.—Carminative, tonic, emmenagogue, antispasmodic. *Dose,* 2 to 4 grams (ʒss–j), in infusion. Thymol externally as an antiseptic.

BOLDUS.—BOLDO.

FIG. 131.



Boldus —Natural size.

Origin.—Peúmus Bóldus, *Molina* (Boldóa frágrans, *Ruiz et Pavon*). *Natural order,* Monimiaceæ.

Habitat.—Chili; cultivated.

Description.—Broadly oval or oval-oblong, about 5 centimeters (2 inches) long, obtuse, rough on both sides, glossy above, hairy beneath, often reddish-brown, fragrant; taste pungent, aromatic, somewhat bitter.

Constituents.—Volatile oil 2 per cent., boldine 0.1 per cent., glucoside 0.3 per cent. (soluble in alcohol and ether), aromatic resin, tannin, etc.

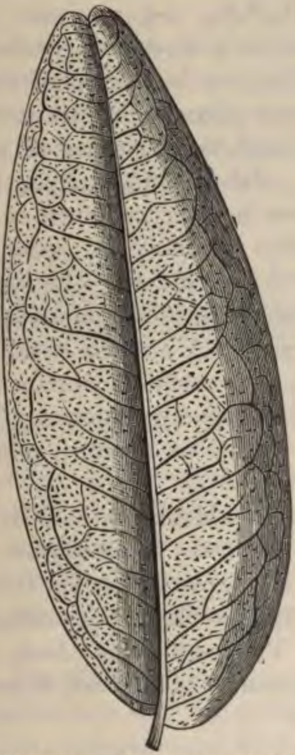
Properties.—Tonic, stimulant. *Dose,* 1 to 4 grams (gr. xv–ʒj), in infusion or tincture.

PILOCARPUS.—JABORANDI.

Origin.—Pilocárpus pennatifólius, *Lémaire.* *Natural order,* Rutaceæ, Xanthoxyleæ.

Habitat.—Brazil, near Pernambuco.

FIG. 132.



Pilocarpus.—Leaflet, natural size.

Description.—Leaves pinnate, with 5 to 11 leaflets, the terminal one with a stalk about 25 millimeters (1 inch) long, and nearly equal at base; the others short-stalked and unequal at the base; oval or ovate-oblong, about 10 centimeters (4 inches) long, entire, and slightly revolute at the margin, near which the anastomosing veins form one or two distinct wavy lines; obtuse and emarginate; coriaceous, pellucid-punctate, mostly smooth; when bruised, slightly aromatic, somewhat pungent and bitter.

Constituents.—Volatile oil (chiefly pilocarpene, $C_{10}H_{16}$); pilocarpine, $C_{11}H_{16}N_2O_2$, $\frac{1}{4}$–$\frac{1}{2}$ per cent., is the principal active constituent; it is crystalline, soluble in water, combines with alkalies, on heating, particularly with HCl, yields jaborine and pilocarpidine, its salts readily soluble in water and alcohol, the physiological action similar to that of nicotine. Jaborine, $C_{22}H_{32}N_4O_4$, is yellow, amorphous, soluble less in water and more in ether than pilocarpine; resembles atropine in action. Pilocarpidine, $C_{10}H_{14}N_2O_2$, is deliquescent; the salts mostly amorphous; action weaker than pilocarpine; on oxidation in air yields syrupy jaboridine, which may be identical with jaborandine, $C_{10}H_{12}N_2O_3$, and resembles jaborine in its action.

Properties.—Sialagogue, diaphoretic. *Dose*, 1 to 2 grams (gr. xv–xxx), in powder or tincture; pilocarpine 0.005 to 0.03 gram (gr. $\frac{1}{14}$–$\frac{1}{2}$).

Other Jaborandis.—Monniéria trifólia, *Linné* (Aublétia trifólia, *Richard*), and Xanthóxylum (Zanthóxylum) élegans, *Engler*, of the natural order Rutaceæ. Serrónia Jaborándi, *Guillemin* (contains jaborandine), Píper reticulátum, *Linné*, P. nodulósum, *Link*, P. citrifólium, *Lamarck*, and Artánthe Mollicóma, *Miquel*, of the natural order Piperaceæ.

LAURUS.—LAUREL, BAY LEAVES.

Origin.—Laúrus nóbilis, *Linné*. *Natural order*, Laurineæ, Litseaceæ.

Habitat.—Basin of the Mediterranean.

Description.—Oblong or lance-oblong, 5 to 10 centimeters

(2 to 4 inches) long, acute at both ends, or the apex rather obtuse, veined beneath, pellucid-punctate, brownish, smooth; aromatic, somewhat bitter.

Constituents.—Volatile oil, tannin, bitter principle.

Properties.—Stimulant, stomachic, astringent.

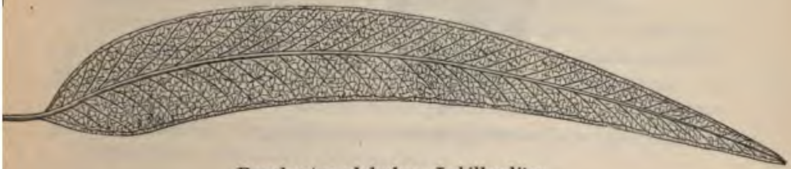
EUCALYPTUS.—EUCALYPTUS.

Origin.—Eucaly′ptus glóbulus, *Labillardière.* *Natural order,* Myrtaceæ, Leptospermeæ.

Habitat.—Australia; cultivated in subtropical countries.

Description.—The leaves are collected from rather old trees. Petiolate, lanceolately scythe-shaped, 15 to 30 centimeters (6 to 12 inches) long, oblique and rounded or somewhat attenuated below, tapering above, entire, leathery, gray-green, glandular, feather-veined between the midrib and marginal veins; odor strongly balsamic; taste pungently aromatic, somewhat bitter, and astringent.

FIG. 133.



Eucalyptus globulus, *Labillardière.*

The leaves of young shoots are broadly ovate, obtuse, cordate at base, pale bluish-green, thinner, and less aromatic.

Constituents.—Volatile oil 6 per cent., tannin, cerylic alcohol, crystallizable fatty acid, crystallizable resin. The volatile oil contains eucalyptene and dextro-pinene, $C_{10}H_{16}$, and cineol or eucalyptol, $C_{10}H_{18}O$.

Properties.—Febrifuge, stimulant, astringent, antiseptic. *Dose,* 0.3 to 1 gram (gr. v–xv), in powder, infusion, tincture, or extract.

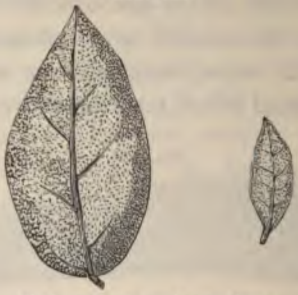
CHEKAN.—Cheken.

Origin.—Eugénia Chékan, *Molina.* *Natural order*, Myrtaceæ, Myrteæ.

Habitat.—Chili.

Description.—Nearly sessile, oval-lanceolate or elliptic, about 25 millimeters (1 inch) long, somewhat revolute on the margin; light green, smooth, delicately wrinkled, pellucid-punctate, aromatic. Usually accompanied by the much-branched rough brown stems.

Fig. 134.



Cheken leaves.—Natural size.

Constituents.—Volatile oil 2 per cent., alkaloid, tannin 4 per cent., ash 9 per cent.

Properties.—Stimulant, diuretic, antiseptic. *Dose*, 2 to 4 grams (ʒss–j).

MYRCIA.—Bay Leaves, Wild Clove Leaves.

Origin.—My'rcia ácris, *De Candolle.* *Natural order*, Myrtaceæ, Myrteæ.

Habitat.—West Indies.

Description.—Elliptic or broadly oval, 5 to 10 centimeters (2 to 4 inches) long, obtuse, reticulate, smooth, pellucid-punctate, aromatic, and spicy.

Constituents.—Volatile oil; it contains several hydrocarbons, eugenol, and little methyl-eugenol.

Properties.—Stimulant, tonic; used for preparing the volatile oil and for bay rum.

AURANTII FOLIA.—ORANGE LEAVES.

Origin.—Cítrus vulgáris, *Risso.* *Natural order,* Rutaceæ, Aurantieæ.

Habitat.—Asia; cultivated in subtropical countries.

Description.—Oval- or ovate-oblong, 5 to 10 centimeters (2 to 4 inches) long, pointed, smooth, pellucid-punctate; petiole articulate, with a broad obovate or obcordate wing; aromatic, somewhat bitter.

The similar leaves of Cítrus Aurántium, *Risso,* have the petioles narrow-winged or nearly naked.

Constituents.—Volatile oil, bitter principle.

Properties.—Stimulant, tonic.

OLEANDER.—OLEANDER.

Origin.—Nérium Oleánder, *Linné.* *Natural order,* Apocynaceæ, Echiteæ.

Habitat.—Basin of the Mediterranean; cultivated.

Description.—Nearly sessile, linear-lanceolate, 10 centimeters (4 inches) long, finely pointed, somewhat revolute, smooth, glossy above, feather-veined; inodorous, bitter, nauseous.

Constituents.—Oleandrine and pseudocurarine (two amorphous alkaloids, the former poisonous), neriantin (glucoside).

Properties.—Sedative, poisonous.

LEDUM.—LABRADOR TEA.

Origin.—Lédum latifólium, *Aiton.* *Natural order,* Ericaceæ, Rhodoreæ.

Habitat.—Canada and Northern United States, west to Minnesota.

Description.—Elliptic oblong, about 3 centimeters (1⅛ inches) long, revolute, rounded or cordate at base, rusty woolly beneath; odor, when bruised, heavy; taste astringent, bitter, somewhat pungent.

Lédum palústre, *Linné,* Marsh tea, grows in the northern continents, and is free from andromedotoxin; leaves linear or lance-linear, otherwise like Ledum latifolium.

Constituents.—Tannin, volatile oil, ericolin, ericinol, resin, etc. (in L. palustre).

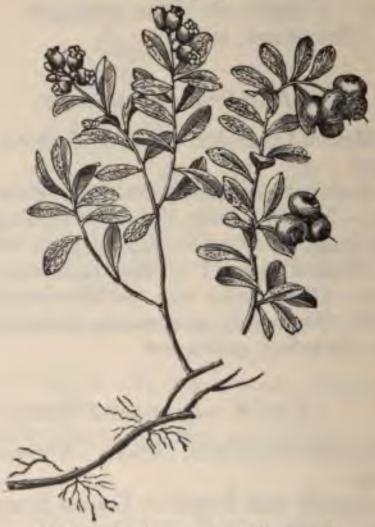
Properties.—Astringent, tonic, alterative, in large doses poisonous (probably due to andromedotoxin). *Dose,* 1 to 2 grams (gr. xv–xxx), in infusion.

UVA URSI.—UVA URSI.

Origin.—Arctostáphylos U'va úrsi, *Sprengel.* *Natural order*, Ericaceæ, Arbuteæ.

Habitat.—Northern Hemisphere, in dry and sandy or rocky places; in the United States south to Pennsylvania, New Mexico, and California.

FIG. 135.

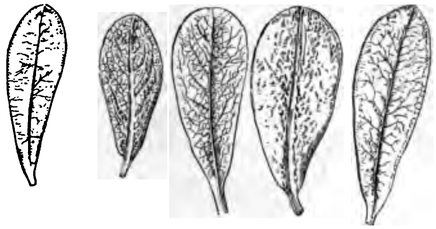


Arctostaphylos uva ursi, *Sprengel.*

Description.—Nearly sessile, obovate or oblong-spatulate, about 2 centimeters ($\frac{4}{5}$ inch) long, obtuse, the apex frequently curved back, slightly revolute on the margin, smooth, glossy on the upper surface, paler and reticulate on the lower surface; odor faint hay-like; taste strongly astringent, somewhat bitter.

Constituents.—Tannin 6–7 per cent., gallic acid, arbutin, ericolin, ursone, ash about 3 per cent. Free from andromedotoxin. Arbutin, $C_{12}H_{16}O_7$, bitter needles, soluble in alcohol and hot water, nearly insoluble in ether; blue with dilute ferric chloride; in alkaline solution azure-blue with phosphomolybdic acid; yields glucose and arctuvin, or hydrokinone (excreted with the urine). Ericolin, $C_{34}H_{56}O_{21}$, yellow, bitter, soluble in water and alcohol, yields glucose and ericinol (volatile oil). Ursone, $C_{10}H_{16}O$, tasteless needles, sparingly soluble in alcohol and ether, insoluble in water.

FIG. 136.



Uva ursi leaves, natural size, showing upper and lower surface.

Properties.—Astringent, tonic, diuretic, nephritic. *Dose*, 1 to 4 grams (gr. xv–ʒj), in decoction or fluid extract.

ARCTOSTAPHYLOS GLAUCA.—MANZANITA.

Origin.—Arctostáphylos glaúca, *Lindley*. *Natural order*, Ericaceæ, Arbuteæ.

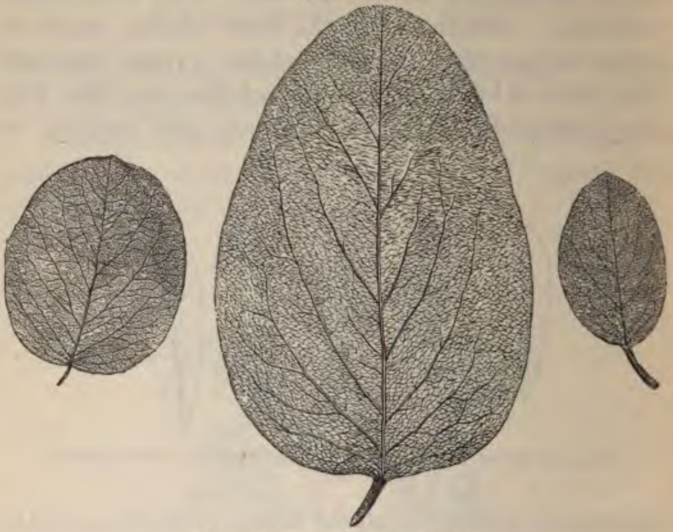
Habitat.—Mountains of California.

Description.—Petiolate, ovate-oblong, about 5 centimeters (2 inches) long, usually acute above and obtuse at base, glaucously pale green; inodorous, astringent and somewhat bitter.

Constituents.—Arbutin, ursone, tannin 9–10 per cent., ash 6 per cent.

Properties and Uses.—Like uva ursi.

FIG. 137.



Manzanita leaves, natural size.

EPIGÆA.—TRAILING ARBUTUS, GRAVEL PLANT.

Origin.—Epigæ'a répens, *Linné.* *Natural order*, Ericaceæ, Ericineæ.

Habitat.—North America, south to Florida, and west to Minnesota; in sandy woods.

Description.—Ovate or suborbicular, cordate, about 5 centimeters (2 inches) long, reticulate, bristly; inodorous; taste astringent and bitter.

Constituents.—Tannin 3–4 per cent., acid resembling gallic acid, arbutin, ericolin, ursone.

Properties and Uses.—Like uva ursi.

KALMIA.—MOUNTAIN LAUREL.

Origin.—Kálmia latifólia, *Linné.* *Natural order*, Ericaceæ, Rhodoreæ.

Habitat.—North America, south to Florida, and west to Tennessee; in damp or rocky woods.

Description.—Elliptic or lance-oval, 5 to 9 centimeters (2 to 3½ inches) long, acute at both ends, smooth and green on both sides; inodorous; taste astringent, bitter.

Constituents. — Tannin, arbutin, resin, andromedotoxin, $C_{31}H_{51}O_{10}$. The latter is a neutral compound, soluble in water, alcohol and chloroform, not precipitated by lead acetates or alkaloid reagents; colored red by warm dilute mineral acids.

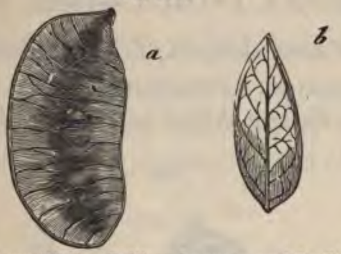
Properties.—Astringent, in large doses poisonous.

SENNA ALEXĂNDRINA.—ALEXANDRIA SENNA.

Origin.—Cássia acutifólia, *Delile. Natural order*, Leguminosæ, Cæsalpineæ, Cassieæ.

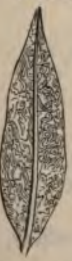
Habitat.—Eastern and Central Africa.

FIG. 138.



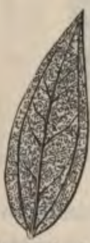
Cassia acutifolia, *Delile.*—Legume and leaflet.

FIG. 139.



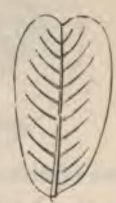
Argel leaf.

FIG. 140.



Coriaria leaf.

FIG. 141.



Tephrosia leaflet.

Description.—Leaves pinnate, with 8 or 10 leaflets, which are lanceolate or lance-oval, about 25 millimeters (1 inch) long, subcoriaceous, brittle, rather pointed, unequally oblique at the base, entire, grayish-green, nearly smooth; odor peculiar; taste nauseous, bitter.

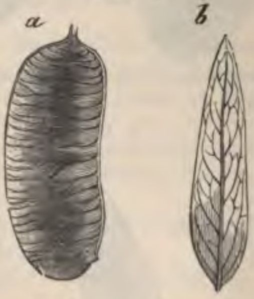
It should be free from stalks and legumes, but often contains argel leaves (from Solenostem′ma A′rgel, *Hayne*), which are thicker, one-veined, glaucous, even at the base, and short-hairy on both sides; not laxative (Schroff). The poisonous three-nerved leaves of Coriária myrtifólia, *Linné*, have occasionally been mixed with senna; also the emarginate leaflets of Tephrósia Appolínea, *De Candolle* (Papilionaceæ, Galegeæ).

SENNA INDICA.—India Senna.

Origin.—Cássia elongáta, *Lémaire-Lisancourt. Natural order*, Leguminosæ, Cæsalpineæ, Cassieæ.

Habitat.—Eastern Africa to India; cultivated.

Fig. 142.



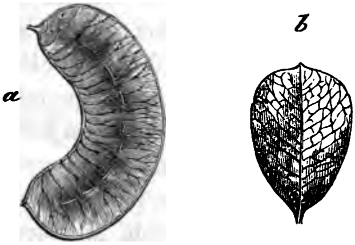
Cassia elongata, *Lém.*—*a.* Legume. *b.* Leaflet.

Description.—Leaves pinnate, with 8 to 16 leaflets, which are lanceolate, from 3 to 5 centimeters (1–2 inches) long, acute, unequally oblique at the base, entire, dull green, smooth, or slightly pubescent, of a peculiar odor, and a mucilaginous, bitter taste.

It should be free from stalks, discolored leaves, and other admixtures.

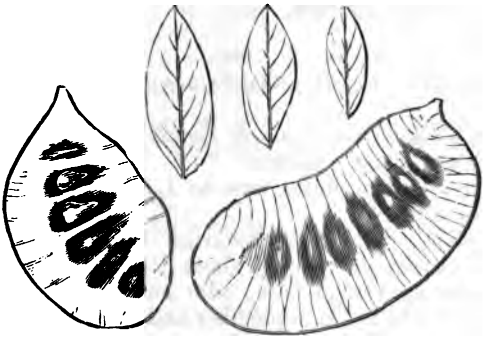
Varieties.—Commercial Alexandria senna sometimes consists of small leaflets of Cássia elongáta, more or less broken, and mixed with the leaflets of Cássia obováta, *Colladon*, known as Senna baladi or wild senna; these are obovate or obovate-oblong, mucronulate, rather longer than C. acutifólia, and are regarded as less efficacious.

FIG. 143.



Cassia obovata, *Colladon*.—*a*. Legume. *b*. Leaflet.

FIG. 144.



Tripoli senna.—Leaflets and legumes.

Tripoli senna. Like Alexandria senna, leaflets more broken, free from argel leaves.

Tinnevelly senna, the cleanest variety of India senna, carefully dried and unbroken; from cultivated plants.

Bombay senna, an ordinary or inferior India senna, often mixed with discolored and small leaves.

Mecca senna, like the preceding, leaflets often brown, broken, and mixed with legumes.

Aden senna, from Cássia holosercícea, *Fresenius* (C. pubéscens, *R. Brown*, s. Sénna ovalifólia, *Batka*), indigenous to Abyssinia; leaflets 10 to 15 millimeters ($\frac{2}{5}$–$\frac{3}{5}$ inch) long, elliptic or oval-oblong, slightly retuse or mucronulate at apex and appressed-hairy upon both surfaces and on the margin. It is rarely seen in commerce.

Constituents.—Chrysophan, phæoretin, sennacrol (soluble in ether), sennapicrin (insoluble in ether), cathartic acid, sennit (cathartomannit), mucilage, ash 10–12 per cent. Cathartic acid is amorphous, black, nearly insoluble in water and alcohol, its alkaline and earthy salts soluble in water, and insoluble in alcohol; mineral acids split it into glucose and cathartogenic acid.

Properties.—Cathartic. *Dose,* 8 to 32 grams (ʒij–℥j), in infusion or fluid extract.

CASSIA MARILANDICA.—AMERICAN SENNA.

Origin.—Cássia mariländica, *Linné.* *Natural order,* Leguminosæ, Cæsalpineæ, Cassieæ.

Habitat.—United States, west to Louisiana and Nebraska; in low grounds.

Description.—Leaves pinnate, with 12 to 18 leaflets, which are ovate-oblong or elliptic, about 25 millimeters (1 inch) long, obtuse, uneven at base; odor and taste senna-like (but weaker), if collected in September and October.

Constituents.—Cathartic acid, probably chrysophan, sugars, mucilage, albuminoids, etc.; ash 7 per cent. *Dose,* 16 to 50 grams (℥ss–jss), in infusion.

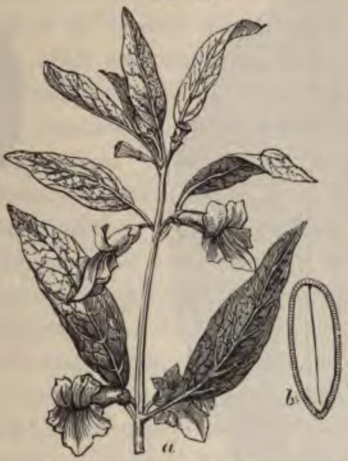
SESAMUM.—Benne.

Origin.—Sésamum índicum, *Linné.* *Natural order*, Pedalineæ, Sesameæ.

Habitat.—India; cultivated.

Description.—Petiolate, ovate-oblong or oblong-lanceolate, pointed, rounded or somewhat heart-shaped at the base, entire, sometimes with a few teeth or two basal lobes, prominently veined, smoothish, mucilaginous. Usèd chiefly in the fresh state.

Fig. 145.



Sesamum indicum, *Linné.*—*a.* Flowering branch. *b.* Section of seed.

Constituents.—Mucilage.

Properties.—Demulcent; used in infusion in dysentery, etc.

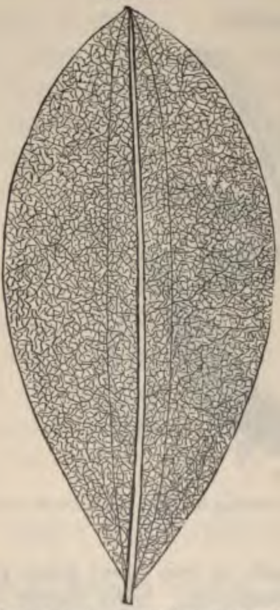
ERYTHROXYLON.—Coca.

Origin.—Erythróxylon Cóca, *Lamarck.* *Natural order*, Lineæ, Erythroxyleæ.

Habitat.—Peru, Bolivia; cultivated.

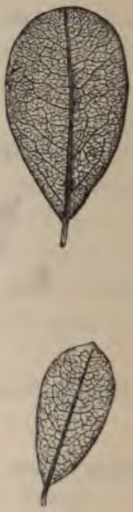
Description.—Ovate or obovate-oblong, 2 to 5, sometimes 10 centimeters ($\frac{3}{4}$ to 2 or 4 inches) long, short-petiolate, entire, rather obtuse or sometimes emarginate at apex, reticulate on both sides, with a prominent midrib, and on each side of it with a curved line (caused by a strand of collenchyme cells; Schrenk, 1887), running from base to apex; odor slight, tea-like, not camphoraceous; taste somewhat bitter and aromatic. Bolivian coca leaves are often much smaller, but are more highly esteemed than the Peruvian leaves. Coca leaves cultivated in Java and India are considered inferior to those of South America; they are stated to be

FIG. 146.



Peruvian coca, lower surface, natural size.

FIG. 147.



Small Bolivian coca, natural size.

derived from E. Coca var. Spruceánum, and the latter from E. boliviánum, *Burck*.

Constituents. — Cocaine, benzoylecgonine, cinnamylcocaine, truxilcocaine (truxilline or cocamine), hygrine (mixture, volatile, oily, readily soluble in water, alcohol, and ether, the dilute solutions of the salts in water fluorescent), cocatannic acid, wax. Cocaine, $C_{17}H_{21}NO_4$, forms colorless, bitter prisms, freely soluble in alcohol and ether, also in water; melts at 98°; with strong HCl yields methyl-alcohol, benzoic acid, and ecgonine, $C_9H_{15}NO_3$, which is sweetish-bitter, freely soluble in water, sparingly soluble in alcohol, and insoluble in ether. Cocaine salts give a violet-purple crystalline precipitate with potassium permanganate. Benzoylecgonine, $C_{16}H_{19}NO_4$, crystallizes with $4H_2O$; when dry melts at 198°; insoluble in ether, freely soluble in alcohol and hot water; yields benzoic acid and ecgonine. Cinnamylcocaine on saponification, yields cinnamic acid (sometimes also isocinnamic acid). Truxilline (cocamine) yields truxillic acid, $C_9H_8O_2$, in several modifications which seem to be polymerics of cinnamic acid. From Java coca leaves benzoyl-pseudotropeïne, $C_{15}H_{19}NO_2$, has been obtained; it melts at 49°, and is easily soluble in alcohol, ether, chloroform, benzol and benzin; yields with HCl benzoic acid and pseudotropine, $C_8H_{15}NO$ (deliquescent rhombic crystals, sparingly soluble in ether, freely in chloroform).

Properties.—Stimulant, diaphoretic. *Dose*, 1 to 4 grams (gr. xv–ʒj), in substance, infusion, fluid extract; usually combined with an alkali. Cocaine as a local anæsthetic in solution of 4 to 8 or 10 per cent.

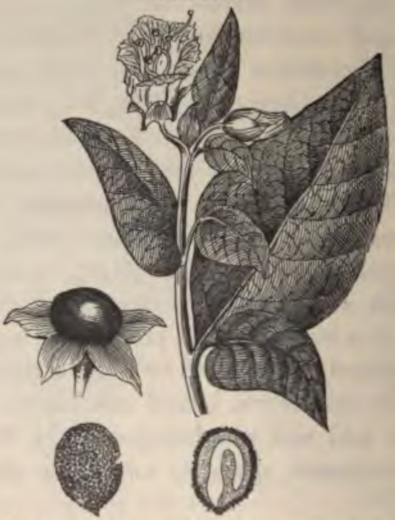
BELLADONNÆ FOLIA.—BELLADONNA LEAVES. DEADLY NIGHTSHADE.

Origin.—A'tropa Belladónna, *Linné.* *Natural order*, Solanaceæ, Atropeæ.

Habitat.—Europe and Asia Minor.

Description.—Ovate-oblong or broadly ovate, 10 to 15 centimeters (4 to 6 inches) long, and 5 to 10 centimeters (2–4 inches) broad, narrowed into a petiole, tapering at the apex, entire, almost smooth, thin, occasionally with circular perforations caused by cork, upper surface brownish-green, lower surface grayish-green; both surfaces, viewed under the magnifying glass, of a whitish granular appearance,

FIG. 148.



Atropa Belladonna, *Linné.*—Branch, fruit, seed, and section of seed, the last two magnified.

due to numerous cells containing a crystalline powder; odor slight, taste bitterish, disagreeable.

Constituents.—About 0.5 per cent. mydriatic alkaloids, choline (bilineurine), mucilage, wax, asparagin, albumin, chrysatropic acid (scopoletin), succinic acid, nitrates, ash 14 per cent. Atropine, $C_{17}H_{23}NO_3$, yields a gold double salt at first oily, finally crystalline, without lustre. Hyoscyamine (see hyoscyamus leaves) is sometimes the predominating alkaloid. Belladonine, a yellow powder, is probably oxyatropine, $C_{17}H_{23}NO_4$, or apoatropine, $C_{17}H_{21}NO_2$.

Properties.—Diuretic, dilating the pupil, narcotic. *Dose,* 0.03 to 0.2 gram (gr. ss–iij).

Antidotes.—Emetics; stimulants (brandy, coffee, etc.); morphine; physostigmine; pilocarpine.

DUBOISIA.—DUBOISIA.

Origin.—Duboísia myoporoídes, *R. Brown.* *Natural order,* Solanaceæ, Salpiglossideæ.

Habitat.—Australia.

Description.—Short-petiolate, lanceolate, about 7 to 10 centimeters (3 to 4 inches) long, 15 to 25 millimeters ($\frac{3}{5}$ to 1 inch) broad, narrowed at both ends, entire, midrib prominent; the margin somewhat revolute; thin, nearly smooth, inodorous and bitter.

Constituents. — Duboisine, volatile alkaloid, resin, etc. Duboisine appears to vary, and to consist of hyoscyamine or sometimes of hyoscine, or scopolamine.

Properties.—Similar to those of belladonna and hyoscyamus. *Dose,* 0.06 to 0.2 gram (gr. j–iij); of the alkaloid, 0.0005 to 0.001 gram (gr. $\frac{1}{120}$–$\frac{1}{60}$).

Antidotes.—Similar as for belladonna.

TABACUM.—TOBACCO.

Origin.—Nicotiána Tabácum, *Linné.* *Natural order,* Solanaceæ, Cestrineæ.

Habitat.—Tropical America; cultivated.

Description.—The commercial dried leaves are used. Oval or ovate-lanceolate, sometimes 50 centimeters (20 inches) long, short petiolate or sessile, acute, entire, brown, friable, glandular-hairy; odor heavy, peculiar; taste nauseous, bitter, and acrid.

Constituents.—Nicotine, $C_{10}H_{14}N_2$, 0.7 to 5, sometimes 11 per cent., nicotianin (scaly, volatile, probably a salt of nicotine, according to others a camphoraceous compound), resin, albumin, gum, extractive, malates, citrates, ash 14 to 18, occasionally 27 per cent. Nicotine is colorless, spec. grav. 1.011, becomes rapidly brown, is pungently acrid, freely soluble in water, alcohol, and ether, and is colored violet with warm HCl, and browned by Cl gas. Tobacco smoke contains a number of pyridine bases.

Properties.—Diuretic, sedative, emetic, narcotic. *Dose*, 0.03 to 0.13 gram (gr. ss–ij); as emetic, 0.3 gram (gr. v), in powder, infusion, or wine; externally as sternutatory, enema, etc.

Antidotes.—Evacuants; astringents; nux vomica; stimulants.

STRAMONII FOLIA.—STRAMONIUM LEAVES.

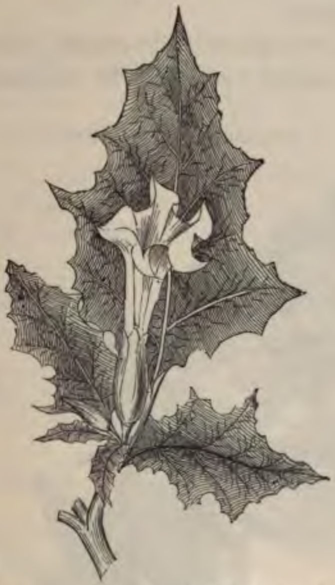
Origin.—Datúra Stramónium, *Linné*. *Natural order*, Solanaceæ, Hyoscyameæ.

Habitat.—Asia; naturalized in most countries.

Description.—Petiolate, ovate, about 15 centimeters (6 inches) long, smooth, pointed, unequal at the base, coarsely and sinuately angular-toothed, smooth or nearly so, dark green and rather fleshy when fresh, frequently with circular perforations, caused by cork; after drying thin, brittle, the upper surface usually brownish-green and somewhat whitish granular under the magnifying glass, due to cells containing a crystalline powder; nearly inodorous; taste unpleasant, bitter, and nauseous.

Datúra Tátula, *Linné*, is very similar, but has the foliage deeper green, and the stem and flowers purple colored.

FIG. 149.



Datura Stramonium, *Linné*.—Flowering branch.

Constituents.—Daturine 0.2 per cent., mucilage, albumin, ash 17 per cent. Daturine is a mixture of atropine and hyoscyamine, the latter usually predominating.

Properties.—Diuretic, dilating the pupil, narcotic. *Dose*, 0.06 to 0.13 gram (gr. j–ij), in powder or extract.

Antidotes.—Evacuation by stomach-pump, or emetic; stimulants (brandy, coffee, etc.); douches; morphine; physostigmine; pilocarpine.

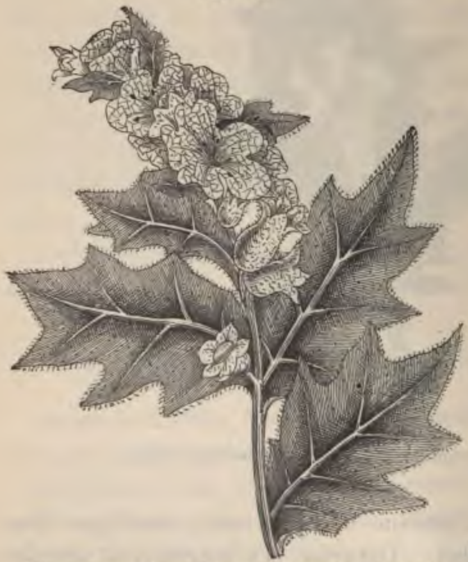
HYOSCYAMI FOLIA.—HYOSCYAMUS LEAVES. HENBANE.

Origin.—Hyoscy'amus nı́ger, *Linné.* *Natural order,* Solanaceæ, Hyoscyameæ.

Habitat.—Europe and Asia; naturalized in some parts of North America.

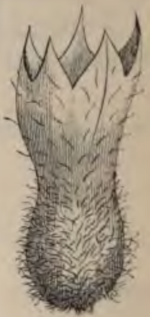
Description.—Ovate or ovate-oblong, sometimes 25 centimeters (10 inches) long, and 10 centimeters (4 inches) broad, petiolate or sessile, acute, sinuate-toothed, the teeth large, oblong, or triangular; grayish-green, hairy; midrib prominent; odor heavy narcotic; taste bitter, somewhat acrid. Some of the flowers having a five-lobed pale yellow and purplish veined corolla, are usually present; occasion-

FIG. 150.



Hyoscyamus niger, *Linné.*—Flowering branch.

FIG. 151.



Calyx, containing capsule, natural size.

ally also the capsule (pyxis) enclosed in the urn-shaped calyx.

Constituents.—Mydriatic alkaloids about 0.3 per cent., choline (bilineurine), hyoscipicrin, $C_{27}H_{52}O_{14}$, mucilage, albumin. Hyoscyamine, $C_{17}H_{23}NO_3$, yields a gold double salt in lustrous yellow scales, which melt at 160° C., but not under water; splits into tropine, $C_8H_{15}NO$, and tropic acid, $C_9H_{10}O_3$. Hyoscine is semi-liquid, isomeric with hyoscyamine, yields tropic acid and pseudotropine, $C_8H_{15}NO$; its gold double salt melts at 196° C. Scopolamine, $C_{17}H_{21}NO_4$, is amorphous or crystalline; the gold double salt melts at 212° C.; splits into atropic acid, $C_9H_8O_2$, and scopoline, $C_8H_{13}NO_2$. By heating hyoscyamine for six hours to near 120° C. (248° F.) it is converted into atropine.

Properties.—Anodyne, hypnotic, dilates the pupil, narcotic. *Dose,* 0.13 to 0.6 gram (gr. ij–x), in powder, tincture, fluid extract, or extract.

Antidotes.—Same as for stramonium.

DIGITALIS.—Digitalis, Foxglove.

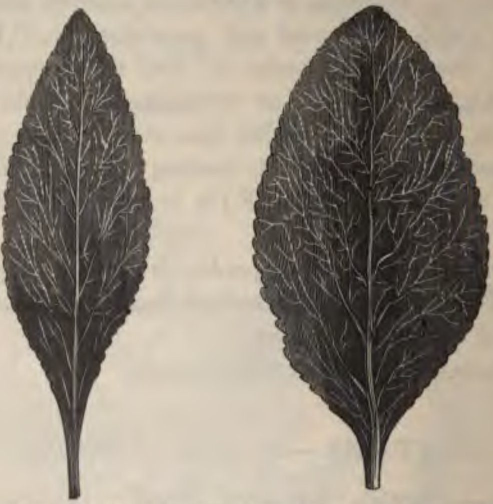
Origin.—Digitális purpúrea, *Linné.* *Natural order,* Scrophularineæ, Digitaleæ.

Habitat.—Europe, in sandy soil and the edges of woods.

Description.—The leaves are collected from plants of the second year's growth. Ovate-oblong, rather acute, narrowed into a petiole; from 10 to 30 centimeters (4 to 12 inches) long; irregularly crenate, downy; dull green and wrinkled above; paler and whitish reticulate beneath; midrib near the base broad; odor faint, tea-like; taste bitter, nauseous.

Constituents.—Digitalin, resin, digitalosmin (stearopten), digitoleic acid, mucilage, extractive, inosit, pectin, ash 10 per cent. Commercial digitalin is a mixture of several compounds, of which the following have been investigated to some extent : Digitoxin is crystallizable, insoluble in water, benzol, and carbon disulphide, sparingly so in ether, soluble in alcohol and chloroform, and by acids is converted into toxiresin. Digitonin, $C_{27}H_{44}O_{13}$, is a glucoside, crystallizes from 85 per cent. alcohol, is soluble in water (the solution foaming), but not in ether, benzol, or chloroform, dissolves with a red color in H_2SO_4 and warm HCl, and splits into dextrose, galactose and digitogenin, which is insoluble in water. Digitalein is soluble in alcohol, ether, and water. Digitalin is crystalline, sparingly soluble in water and ether, soluble in alcohol. These principles are cardiac poisons, while another, digitin, has no such action. The behavior to solvents is more or less altered by the presence of other principles.

FIG. 152.



Digitalis.—Leaf of the first and of the second year's growth.

Properties.—Diuretic, sedative, narcotic. *Dose,* 0.06 to 0.13 gram (gr. j–ij), in powder, infusion, tincture, or extract. The dose of digitalin is uncertain, owing to its variable composition; crystallized digitalin (digitoxin; but sometimes consists of digitonin) is given in doses of 0.05 to 0.1 milligram ($\frac{1}{1300}$–$\frac{1}{650}$ grain).

Antidotes.—Evacuants (stomach-pump or emetics); tannin; stimulants (injections); aconitine.

MATICO.—MATICO.

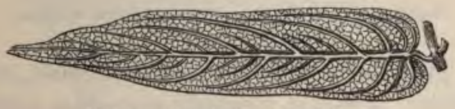
Origin.—Píper elongátum, *Vahl* (Artánthe elongáta, *Miquel*). *Natural order,* Piperaceæ, Pipereæ.

Habitat.—Tropical America.

Description.—Short petiolate, oblong-lanceolate, 10 to 15 centimeters (4 to 6 inches) long, pointed, unequally heart-shaped, very finely crenulate, tessellated above, reticulate and rough beneath, the meshes small, and the veins densely brownish-hairy; aromatic, spicy, and bitterish.

The leaves of Artánthe adúnca, *Miquel,* are not tessellated, rough, and hairy like true matico.

FIG. 153.



Matico.—One-half natural size.

Constituents.—Volatile oil 2½ per cent., pungent resin, bitter principle, artanthic acid (crystalline), tannin, mucilage, etc.

Properties.—Stimulant, tonic, vulnerary, styptic. *Dose,* 1 to 4 grams (gr. xv–ʒj), in powder, infusion, or extract; also externally as a styptic.

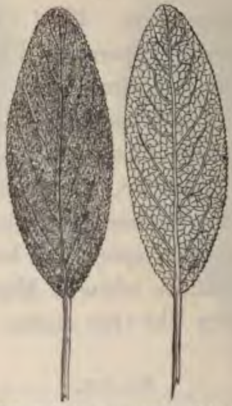
SALVIA.—SAGE.

Origin.—Sálvia officinális, *Linné.* *Natural order*, Labiatæ, Monardeæ.

Habitat.—Southern Europe; cultivated.

Description.—Petiolate, ovate-oblong, about 5 centimeters (2 inches) long, obtuse, or rather acute, finely crenulate, the base narrowed, rounded, somewhat heart-shaped or auriculate (the latter forms rare in market), thickish, wrinkled, grayish-green, and beneath reticulate, soft hairy, and glandular; aromatic, bitterish, somewhat astringent.

FIG. 154.



Salvia.—Natural size, upper and lower surface.

Constituents.—Volatile oil ½–¾ per cent., resin, tannin, albumin, extractive, etc. The volatile oil is of spec. grav. 0.89, freely soluble in alcohol, and contains pinene, cineol, and salviol, $C_{10}H_{18}O$.

Properties.—Stimulant, tonic, astringent, vulnerary. *Dose*, 1 to 4 grams (gr. xv–ʒj), in infusion; externally as a gargle, etc.

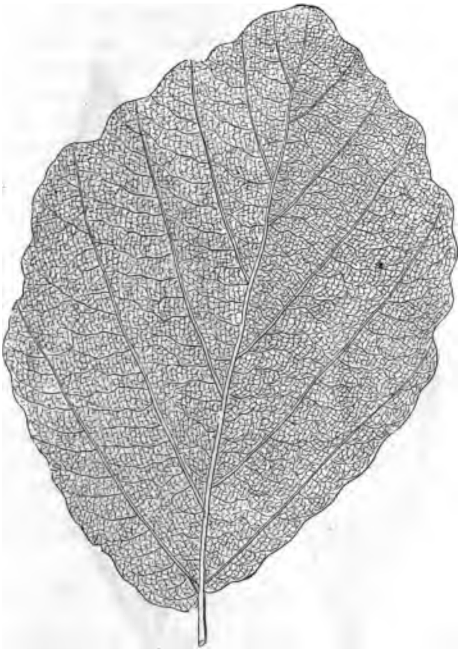
HAMAMELIS.—Hamamelis. Witch Hazel.

Origin.—Hamamélis virginiána, *Linné. Natural order,* Hamamelideæ.

Habitat.—North America, westward to Minnesota and Louisiana; in thickets.

Description.—Short-petiolate, thickish, 10 to 15 centimeters (4–6 inches) long, obovate or oval-obovate, obtuse, wavy-toothed, narrowed below, and oblique and slightly heart-shaped at base, feather-veined, nearly smooth, inodorous, taste astringent and bitter.

Fig. 155.



Hamamelis virginiana.—Leaf one-half natural size.

Constituents.—Tannin, bitter principle, trace of volatile oil.

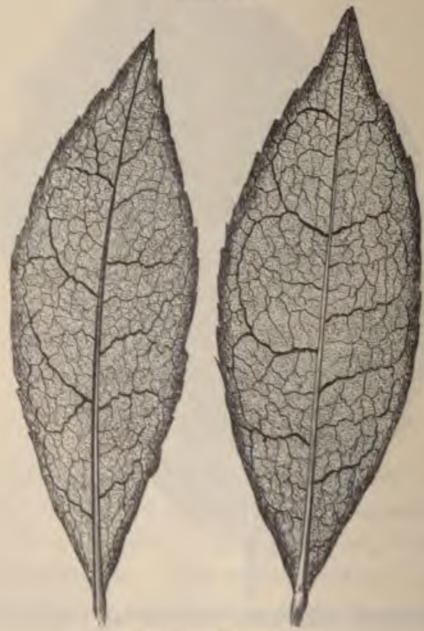
Properties.—Tonic, astringent, somewhat sedative; externally in skin diseases. *Dose*, about 4 grams (ʒj), in decoction or fluid extract.

THEA.—TEA.

Origin.—Caméllia Théa, *Link*, s. (Théa chinénsis, *Sims*). *Natural order*, Ternstrœmiaceæ, Gordonieæ.

Habitat.—Southeastern Asia; cultivated.

FIG. 156.



Tea leaves.—Natural size.

Description.—Short-petiolate, oval or oblanceolate, 25 to 50 or 75 millimeters (1 to 2 or 3 inches) long, acute at both ends, or rather obtuse above, irregularly serrate, except near the base, the lateral veins anastomosing near the margin; smooth or the veins somewhat pubescent; odor agreeable, peculiar; taste pleasantly astringent and bitterish. In commerce the leaves are rolled; bluish green or blackish.

Adulterations with other leaves are recognized by the shape, the character of the venation, and the serratures on the margin.

Constituents.—Volatile oil 0.6–1 per cent., theine (chemically identical with caffeine, but produces spasms and convulsions, and its lethal dose is larger than that of caffeine), 1½–4 per cent. (Indian and Ceylon teas contain between 3.2 and 4.6 per cent. of theine, Paul and Cownley, 1887), theophylline (isomeric with theobromine, readily soluble in hot water), tannin 11 to 21 per cent. (Hooper, 1889), boheic acid, albumin, wax, resin, ash 4–6 per cent., containing about 14 per cent. of phosphoric acid. Tea leaves yield about 40 per cent. of aqueous extract.

Properties.—Astringent, tonic, stimulant, nervine. *Dose,* 2 to 8 grams (ʒss–ij), in infusion.

ILEX PARAGUAYENSIS.—MATÉ, PARAGUAY TEA.

Origin.—I'lex paraguayénsis, *Lambert. Natural order,* Ilicineæ.

Habitat.—Brazil and Argentine Republic.

Description.—Short-petiolate, lance-oblong, about 5 centimeters (2 inches) long, nearly obtuse, margin few-toothed; smooth; odor slight; taste astringent, bitterish and somewhat empyreumatic. The commerchial maté consists of the slightly torrefied leaves, reduced to coarse powder.

Constituents.—Tannin 10-16 per cent., caffeine, 0.2–1.6 per cent., little volatile oil and stearopten, wax, glucoside, proteids about 8 per cent., ash 4 to 8 per cent.

Properties and Dose.—Like thea.

TURNERA.—DAMIANA.

Origin.—Turnéra diffúsæ, *Willdenow,* var. aphrodisíaca, *Urban. Natural order,* Turneraceæ.

Habitat.—Mexico.

Description.—Short-petiolate, thickish, obovate, lance-obovate, or oblong, 10 to 25 millimeters (⅖–1 inch) long, rather obtuse, with a wedge-shaped base and on each side of the margin with from 3 to 6 teeth; the pinnate veins prominent beneath; light green, nearly smooth, somewhat aromatic. The much-branched stems and small pentamerous yellow flowers are sometimes present.

Haplopáppus (Aplopáppus) discoídeus, *De Candolle*, False damiana. *Natural order*, Compositæ. Leaves lanceolate or oblanceolate, acute, 1- to 3-toothed on each side, roughish and minutely dotted; involucre of flower-heads imbricate, florets yellow, pappus hairy.

FIG. 157.

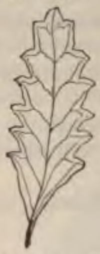


FIG. 158.

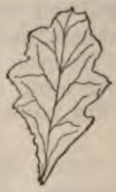
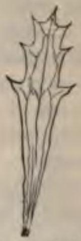


FIG 159.



Figs. 157, 158.—Turnera leaves.—Natural size.
Fig. 159.—Aplopappus leaf.—Natural size.

Constituents.—Volatile oil, resin, bitter principle, tannin.

Properties.—Stimulant, tonic, laxative. *Dose*, 2 grams (gr. xxx), in fluid extract.

CASTANEA.—CHESTNUT LEAVES.

Origin.—Castánea vésca, *Gærtner* (C. satíva, *Miller*, var. americána; C. dentáta, *Marshall*). *Natural order*, Cupuliferæ, Quercineæ.

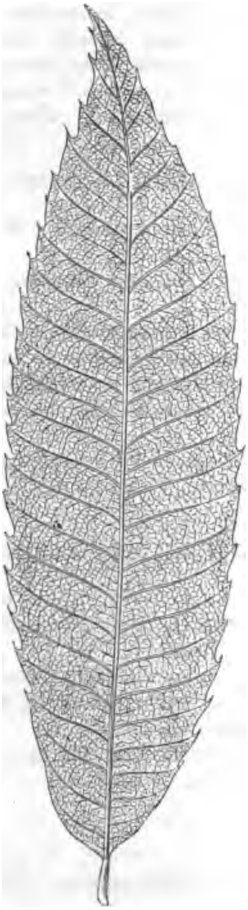
Habitat.—North America, from Ontario south to Florida, and west to Arkansas and Michigan.

Description.—From 15 to 25 centimeters (6 to 10 inches) long, about 5 centimeters (2 inches) wide, petiolate, oblong-lanceolate, acuminate, mucronate, feather-veined, sinuate serrate, smooth, of a slight odor and a somewhat astringent taste.

They should be collected in September or October, while still green.

Constituents.—Tannin, about 9 per cent., gum, albumin, resin, fat, ash 5–6 per cent.

Fig. 160.



Castanea.—Leaf one-half natural size.

Properties.—Tonic, mild sedative. *Dose,* 2 to 8 grams (ʒss–ij), in infusion or fluid extract, in whooping-cough.

PERSICA.—PEACH LEAVES.

Origin.—Prúnus Pérsica, *Linné* (Pérsica vulgáris, *De Candolle*). *Natural order*, Rosaceæ, Pruneæ.

Habitat.—Levant; cultivated.

Description.—Short-petiolate, lanceolate, about 10 centimeters (4 inches) long, pointed, closely serrate, smooth; odor slight, in infusion bitter-almond like; taste bitter.

Constituents.—Amygdalin, or allied compound, tannin.

Properties.—Mild sedative, tonic. *Dose*, 2 grams (gr. xxx) in infusion.

TUSSILAGO.—COLTSFOOT.

Origin.—Tussilágo Fárfara, *Linné*. *Natural order*, Compositæ, Eupatoriaceæ.

Habitat.—Northern Asia and Europe, naturalized in the United States.

Description.—Long-petiolate, roundish heart-shaped, about 10 centimeters (4 inches) in diameter, 5- to 7-nerved, angular-toothed, smooth and green above, white tomentose beneath; inodorous; taste mucilaginous, bitterish, and slightly astringent.

Constituents.—Mucilage, bitter amorphous glucoside, tannin.

Properties.—Demulcent, tonic. *Dose*, 2 to 4 grams (ʒss–j), in decoction.

ILEX OPACA.—HOLLY.

Origin.—I'lex opáca, *Aiton*. *Natural order*, Ilicineæ.

Habitat.—United States, from Massachusetts to Florida, and from Missouri to Texas.

Description.—Petiolate, oval, about 5 centimeters (2 inches) long, spinous wavy-toothed, coriaceous, smooth, inodorous; taste mucilaginous, bitterish, astringent.

Constituents.—Bitter principle, tannin.

Properties.—Demulcent, tonic, emetic. *Dose*, 1 to 2 grams (gr. xv–xxx).

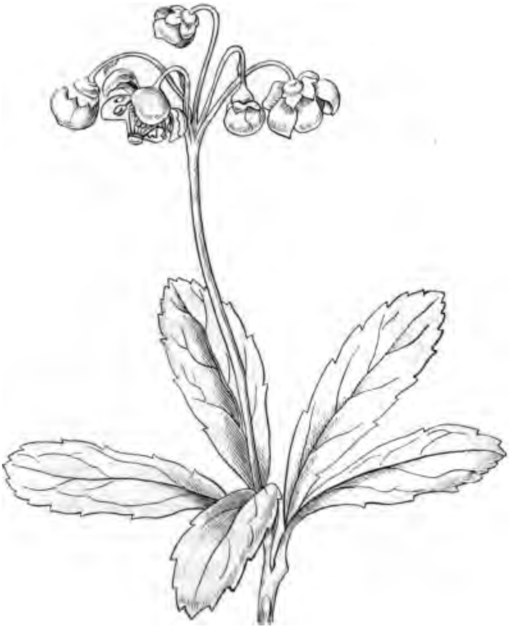
CHIMAPHILA.—PIPSISSEWA, PRINCE'S PINE.

Origin.—Chimaphíla (Chimáphila) umbelláta, *Nuttall*. *Natural order*, Ericaceæ, Pyroleæ.

Habitat.—Northern continents.

Description.—Oblanceolate, about 5 centimeters (2 inches) long, sharply serrate above, wedge-shaped and nearly entire toward the base; coriaceous, smooth, dark green on upper surface; nearly inodorous, and of an astringent and bitterish taste.

FIG. 161.



Chimaphila umbellata; upper part of flowering stem.

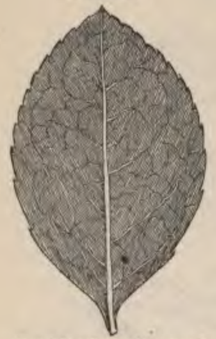
The leaves of the spotted pipsissewa, Chim. maculáta, *Pursh*, indigenous to North America, are lanceolate or ovate-lanceolate, about 5 centimeters (2 inches) long, serrate, and upon the upper surface variegated with white.

Constituents.—Arbutin, ericolin, urson, tannin 4 per cent., chimaphilin (yellow, tasteless, volatile prisms, red by sulphuric acid), several white crystalline principles (tasteless, volatile, melting at 153°, 166°, and above 250° C.; possibly solid hydrocarbons—J. C. Peacock, 1892), resin, sugar, gum, ash 5 per cent. Free from andromedotoxin.

Properties.—Astringent, tonic, diuretic, nephritic. *Dose*, 1 to 4 grams (gr. xv–ʒj), in decoction or fluid extract.

GAULTHERIA.—Gaultheria, Wintergreen.

Fig. 162.



Gaultheria.—Natural size.

Origin. — Gaulthéria procúmbens, *Linné*. *Natural order*, Ericaceæ, Andromedeæ.

Habitat.—North America, west to Minnesota and south to Georgia.

Description. — Short-petiolate, obovate or roundish-oval, about 4 centimeters ($1\frac{3}{5}$ inches) long, and 2 centimeters ($\frac{4}{5}$ inch) or more broad, mucronate, slightly serrate with appressed teeth, coriaceous, smooth, glossy-green above, paler beneath; fragrant; taste aromatic and astringent.

Constituents.—Volatile oil, 0.5 per cent., arbutin, ericolin, urson, resins, tannin 6 per cent., sugar, gum, proteids, ash 4 to 5 per cent. Free from andromedotoxin. The volatile oil is of spec. grav. 1.175, readily soluble in alcohol, colored dark purple by ferric chloride in alcoholic solution, and with nitric acid yields colorless prisms; it consists of gaultherilene, $C_{10}H_{16}$, and mainly of methyl salicylate, $CH_3C_7H_5O_3$.

Properties.—Stimulant, astringent, diuretic, emmenagogue. *Dose*, 1 to 4 grams (gr. xv–ʒj), in infusion.

LAUROCERASUS.—Cherry Laurel.

Origin.—Prúnus (Cérasus, *Loiseleur*) Laurocérasus, *Linné*. *Natural order*, Rosaceæ, Pruneæ.

Habitat.—Western Asia; cultivated in Southern Europe.

Description.—Short-petiolate, about 15 centimeters (6 inches) long, oblong or oblong-lanceolate, acute, somewhat revolute, distantly sharply serrate, dark green and glossy above, dull green beneath, and on the lower surface near the base one to three pairs of depressed glands; odor (when bruised) bitter-almond like; taste aromatic, bitter. Generally used in the fresh state.

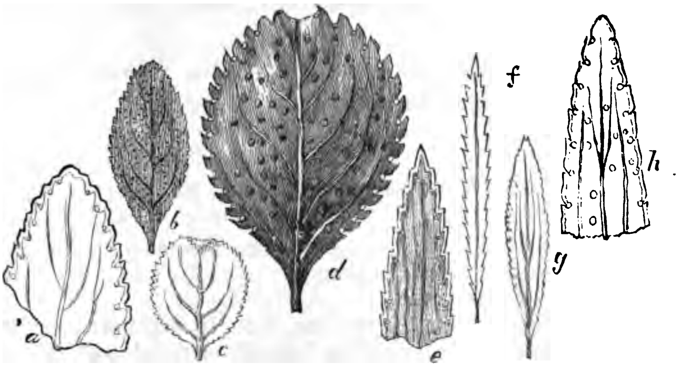
Constituents.—Laurocerasin (amorphous, insoluble in ether, possibly a compound of amygdalin), a ferment, bitter principle, tannin, sugar, gum; after bruising and macerating in water, yield hydrocyanic acid and volatile oil, consisting of benzaldehyde, C_7H_6O.

Properties.—Sedative; used for making cherry-laurel water.

BUCHU.—Buchu.

Origin.—Barósma betulína, *Bartling*, Bar. crenuláta, *Hooker*, and Bar. serratifólia, *Willdenow*. *Natural order*, Rutaceæ, Diosmeæ.

Fig. 163.



Buchu.—*a, b.* Barosma crenulata, *Hooker*. *c, d.* Bar. betulina, *Bartling*. *g. h.* Bar. serratifolia, *Willdenow*. *e, f.* Empleurum serrulatum, *Aiton*. *b, c, f, g,* natural size.

Habitat.—Southern Africa.

Description.—Roundish-obovate, with a rather wedge-shaped base (B. betulina), or varying between oval and obovate (B. crenulata), about 2 to 3 centimeters ($\frac{4}{5}$–$1\frac{1}{5}$ inch) long, obtuse, crenate or serrate, with a gland at the base of each tooth, dull yellowish-green, thickish, smooth, pellucid-punctate; strongly aromatic, somewhat mint-like, pungent, and bitterish. Portions of the branchlets, flowers, and capsurles are sometimes mixed with this drug.

The leaves of Bar. serratifolia are about 3 to 4 centimeters (1_{5}–$1\frac{3}{5}$ inches) long, thinner, linear-lanceolate, obtuse—otherwise like the preceding.

Varieties.—Short buchu from B. betulina and B. crenulata; long buchu from B. serratifolia. The latter are sometimes mixed with the very similar leaves of Empleúrum serrulátum, *Aiton* (*Natural order*, Rutaceæ), which are narrow linear, and, at the apex, acute and glandless.

Constituents.—Volatile oil (1–1.6 per cent. from short, 0.66 from long buchu; the stearopten, diosphenol, $C_{10}H_{16}O_2$, is colored black-green by ferric salts), resin, mucilage (in a layer beneath the upper epidermis), bitter principle, rutin (?), etc.

Properties.—Stimulant, tonic, diuretic. *Dose,* 1 to 2 grams (gr. xv–xxx), in infusion or fluid extract.

ERIODICTYON.—MOUNTAIN BALM.

Origin.—Eriodíctyon califŏrnicum, *Bentham.* *Natural order*, Hydrophyllaceæ, Nameæ.

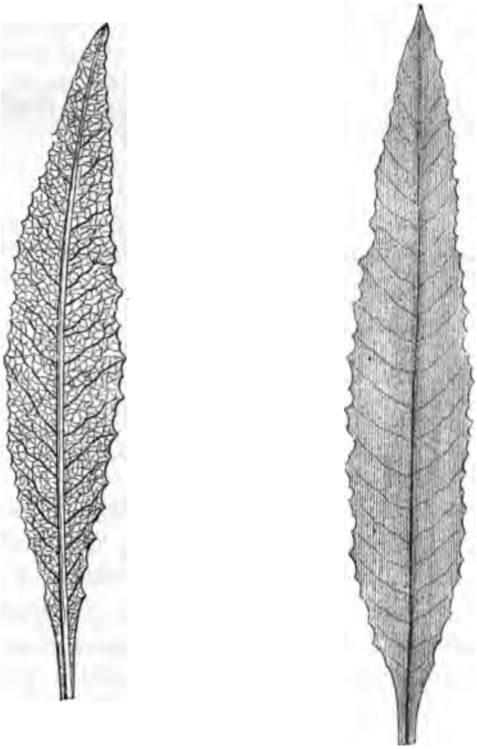
Habitat.—California.

Description.—Elliptic-lanceolate, 5 to 10 centimeters (2 to 4 inches) long, $\frac{3}{8}$ to $\frac{5}{8}$ inch (9 to 15 millimeters) broad, rather acute, more or less sinuately dentate; upper surface smooth, green, and varnished; lower surface reticulate and white-hairy; somewhat aromatic and balsamic, free from bitterness.

Constituents.—Volatile oil, resin.

Properties.—Expectorant. *Dose,* 2 to 4 grams (ʒss–j), in decoction or fluid extract.

FIG. 164.



Eriodictyon.—Leaves, natural size, lower and upper surface.

COMPTONIA.—SWEET FERN.

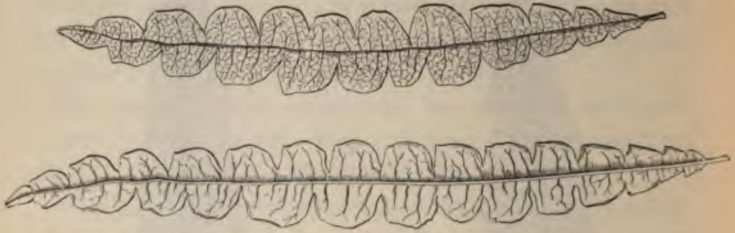
Origin.—Myríca (Comptónia, *Aiton*) asplenifólia, *Endlicher*. *Natural order*, Myricaceæ.

Habitat.—North America, south to North Carolina, west to Minnesota, in sterile soil.

Description.—Short-petiolate, linear-lanceolate, about 7 centimeters (3 inches) long, rather thin, pinnatifid with alternate roundish lobes, pubescent, resin-dotted; stipules two, small, obliquely ovate, acuminate; aromatic and astringent.

Constituents.—Volatile oil (about 0.1 per cent.; spec. grav. 0.926; odor cinnamon-like), tannin, gallic acid (?), a saponin-like compound, etc.

FIG. 165.



Comptonia leaves, upper and lower surface.

Properties.—Stimulant, astringent. *Dose*, 1 to 2 grams (gr. xv–xxx).

HEPATICA.—LIVERWORT.

Origin.—Anemóne (Anémone) Hepática, *Linné* (Hepática tríloba, *Chaix*), and A. (Hepática, *De Candolle*) acutíloba, *Lawson*. *Natural order*, Ranunculaceæ, Anemoneæ.

Habitat.—North America and Europe, in woods.

Description.—Broad kidney-heart-shaped, about 5 centimeters (2 inches) long and broad, long-petiolate, three-lobed, the lobes obtuse or acute; slightly leathery, smooth, and dark green above; inodorous, insipid, slightly astringent, slightly bitterish. The leaf of the European plant is intermediate in shape.

Constituents.—Mucilage, sugar, little tannin.

Properties.—Demulcent, deobstruent, tonic. *Dose*, 2 to 8 grams (ʒss–ij), in decoction.

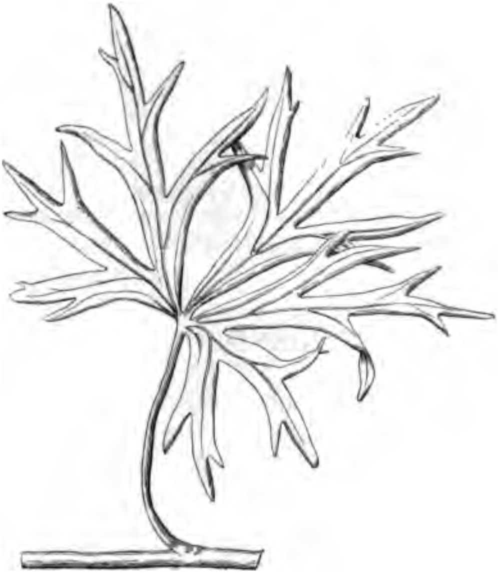
ACONITI FOLIA.—ACONITE LEAVES.

Origin.—Aconítum Napéllus, *Linné*. *Natural order*, Ranunculaceæ, Helleboreæ.

Habitat.—Europe, Northern Asia, Western North America, in mountainous regions.

Description.—Leaves petiolate, suborbicular, somewhat cordate, 5 to 10 centimeters (2 to 4 inches) in diameter, smooth, somewhat glossy above, palmately three- or five-parted, the segments narrow wedge-shaped and incised, the divisions linear-lanceolate and toothed; petiole and midrib with a furrow above; odor slight; taste gradually bitter, acrid, tingling.

FIG. 166.



Aconite leaf, natural size.

The leaves of Aconítum Stoerckeánum, *Reichenbach*, have the parts broadly wedge-shaped and the divisions lanceolate. The leaves of the Ac. Cammárum, *Jacquin*, have ovate or rhomboid segments.

Constituents.—Aconitine (see Aconiti radix, page 152), napelline, gum, sugar, albumin, tannin, aconitic acid, ash 16 per cent.

Properties.—Anodyne, sedative, poisonous. *Dose,* 0.06 to 0.20 gram (gr. j–iij), in powder or extract.

Antidotes.—Emetic (vegetable or mineral); friction of skin; inhalation of amyl nitrite; atropine.

MENYANTHES.—BUCKBEAN, BOGBEAN.

Origin.—Menyánthes trifoliáta, *Linné.* *Natural order,* Gentianeæ, Menyantheæ.

Habitat.—Temperate Northern Hemisphere, in bogs.

Description.—Long-petioled, trifoliate; leaflets sessile, about 5 centimeters (2 inches) long, obovate-oblong, obtuse, narrowed below, entire or somewhat crenate, smooth, pale green; inodorous, bitter.

Constituents.—Menyanthin (amorphous, precipitated by Mayer's reagent and tannin, soluble in alcohol and hot water, sparingly soluble in ether, glucoside, yields menyanthol, having an aromatic odor), mucilage, albumin, saccharose, fat (cholesterin and ceryl-esters), probably carotin.

Properties.—Tonic, antiscorbutic, emmenagogue, vermifuge, febrifuge. *Dose,* 1 to 3 grams (gr. xv–xlv), in decoction or extract.

RHUS TOXICODENDRON.—POISON OAK.

Origin.—Rhus Toxicodéndron, *Linné.* *Natural order,* Anacardiaceæ, Anacardieæ.

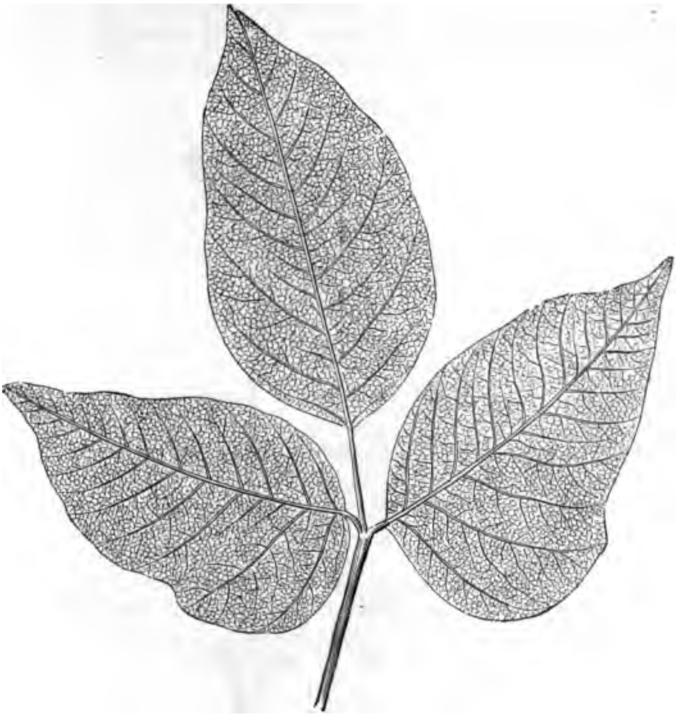
Habitat.—North America, west to Wyoming and Texas, in thickets.

Description.—Long-petioled, trifoliate; the lateral leaflets nearly sessile, about 10 centimeters (4 inches) long, obliquely-ovate, pointed; the terminal leaflet stalked, ovate or oval, pointed, often with a wedge-shaped base; all leaflets either entire or variously notched, coarsely toothed or lobed, downy beneath; after drying papery and brittle; inodorous, somewhat astringent, and acrid.

Constituents.—Toxicodendric acid (volatile, reduces gold from the chloride), tannin, fixed oil, wax, mucilage, etc.

Properties.—Irritant, rubefacient; in paralysis, etc. *Dose,* 0.12 to 0.3 gram (gr. ij–v), gradually increased, in powder or tincture.

FIG. 167.



Rhus toxicodendron.—Leaf one-half natural size.

RUTA.—RUE.

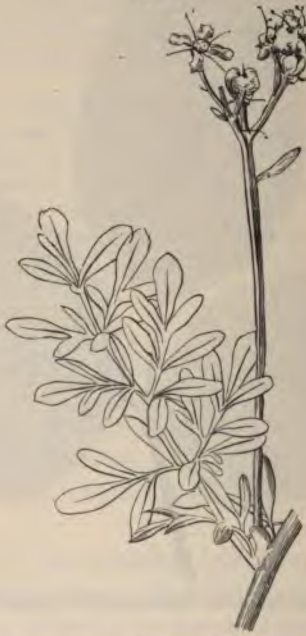
Origin.—Rúta graveólens, *Linné.* *Natural order*, Rutaceæ, Ruteæ.

Habitat.—Southern Europe; cultivated.

Description.—Petiolate, triangular-ovate in outline, 5 to 10 centimeters (2 to 4 inches) long, the upper ones pinnatifid, the others twice or thrice pinnate, the divisions thickish, spatulate or obovate-oblong, sparingly crenate, the terminal ones larger, yellowish-green, smooth, finely pellucid-punctate, aromatic, balsamic, bitter, somewhat acrid.

Constituents.—Volatile oil ¼ per cent., rutin, $C_{42}H_{50}O_{25}$, resin, etc. The volatile oil is greenish-yellow, freely soluble in alcohol, consists chiefly of methyl-nonyl-ketone, $CH_3.CO.C_9H_{19}$, and with nitric acid yields œnanthylic, caprylic, pelargonic, and caprinic acids. Rutin forms light yellow needles, is soluble in alcohol, less freely in water, sparingly soluble in ether; green with ferric chloride; with acid splits into isodulcit and quercetin.

FIG. 168.



Ruta graveolens.—Leaf with axillary branch.

Properties.—Irritant, stimulant, emmenagogue, nervine. *Dose*, 0.3 to 1.3 gram (gr. v–xx), in infusion.

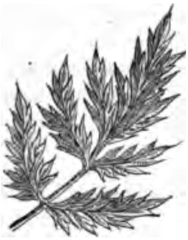
CONII FOLIA.—CONIUM, HEMLOCK.

Origin.—Coníum maculátum, *Linné.* *Natural order*, Umbelliferæ, Ammineæ.

Habitat.—Asia and Europe; naturalized in North America, in waste and moist places.

Description.—Petioles hollow and sheathing, upper leaves sessile, broadly triangular-ovate in outline, 10 to 30 centimeters (4 to 12 inches) long, pinnately twice or thrice decompound, pinnæ oblong-lanceolate, pointedly toothed or incised; thin, gray-green, smooth; odor and taste disagreeable, narcotic.

FIG. 169.



Conium.—Terminal portion of pinna.

Constituents.—Coniine (a minute quantity), volatile oil (not poisonous), albumin, mucilage, ash 12 per cent.

Properties.—Sedative, narcotic. *Dose,* 0.3 gram (gr. v); much larger doses have produced little effect.

Antidotes.—Emetic; astringents; stimulants; application of warmth to extremities.

7. HERBS.—HERBÆ.

Under this heading all those drugs are comprised which are usually met with in commerce having those organs which are necessary for their botanical identification. Besides the few medicinal cryptogams, all medicinal herbs are dicotyledons, and consist mostly of leaves and tender tops, the stems, if hard and tasteless, being rejected. Cryptogams which are employed in a partially developed state, or in a condition unsuited for botanical identification, will be found in Class 12.

Classification.

Sect. I. Thallogens. Plants destitute of fibro-vascular tissue and flowers.

Thallus filiform, flattened above, repeatedly forked, margin crisped.	Chondrus.
Thallus flattened, with air-vesicles in pairs.	Fucus vesiculosus.
Thallus compressed, the air-vesicles single.	Fucus nodosus.
Thallus flattened, lobed, and toothed; brownish above, whitish beneath.	Cetraria.

Sect. II. Ferns.

Stipe polished; frond pinnate; leaflets triangular-oblong.	Adiantum.

Sect. III. Dicotyledons.

1. Petals distinct.

a. Petals five or four (3 in Polygala): stamens more than five; leaves alternate.

Leaves with linear acute lobes; akenes numerous, tipped with a long hairy style.	Pulsatilla.
Base of stem tuberous; leaves three-divided; akenes numerous, short-beaked.	Ranunculus.
Rhizome golden yellow; leaves trifoliate; follicles 7, few seeded.	Coptis.
Leaves lyrate-pinnatifid; capsule linear.	Chelidonium.
Leaves mostly radical, toothed or pinnatifid; pod inversely heart-shaped; petals white.	Bursa pastoris.
Stem somewhat woody; leaves simple; capsule several- or many-seeded.	Helianthemum.
Leaves linear-oblong, pellucid-punctate; flowers yellow with black dots.	Hypericum.
Flowers irregular, purple; stamens 8, united.	Polygala.
Stamens diadelphous; leaves trifoliate, leaflets toothed, fragrant.	Melilotus.
Stamens monadelphous; leaves small trifoliate; leaflets entire; twigs pentangular.	Scoparius.
Stem woody; leaves lance-ovate; flowers purple.	Spiræa.
Leaves interruptedly pinnate; flowers small, yellow; calyx uncinate.	Agrimonia.
Leaves digitate, five-foliate; flowers axillary, yellow.	Potentilla.

Leaves lance-oblong; flowers showy, yellow, capsule long.	Œnothera
Leaves lanceolate; flowers showy, purplish; capsule linear.	Epilobium.
b. Petals and stamens five.	
Leaves with foliaceous pinnatifid stipules; corolla one-spurred.	Viola tricolor.
Leaves rosulate, fleshy, glandular-bristly.	Drosera.
c. Petals and stamens numerous.	
Sepals and white petals imbricate; branches fleshy, pentangular, spiny.	Cactus.
2. Petals united.	
a. Flowers in a close head on a receptacle surrounded by an involucre.	
Pappus slender, bristly; leaves lanceolate, connate-perfoliate.	Eupatorium.
leaves alternate; rays numerous, very narrow purplish or whitish.	Erigeron.
rays inconspicuous, not longer than pappus.	Erigeron. canadense.
florets yellow; heads in recurved racemes, small; odor anise-like.	Solidago.
Pappus three awns; florets yellow; rays conspicuous; leaves broadly spatulate or oblong.	Grindelia.
Pappus 2 or 3 awns; florets yellow; leaves spatulate or linear.	Grindelia squarrosa.
Pappus of 5 awned scales; florets yellow; rays conspicuous; stem winged.	Helenium.
Pappus none, or a short crown; leaves alternate;	
rays white; receptacle conical, chaffy.	Cotula.
rays white; receptacle flat, chaffy.	Achillea.
rays white; receptacle convex, naked.	Parthenium.
rays yellow; receptacle convex, naked.	Tanacetum.
rays none; receptacle small, hairy.	Absinthium.
receptacle small, smooth; leaves green above;	Artemisia.
plant white woolly.	Gnaphalium.
rays yellow; receptacle flat, naked.	Calendula.
rays none; receptacle bristly; involucre and leaves soft-spiny.	Centaurea.
b. Flowers not in heads; corolla more or less two-lipped.	
Leaves alternate; stamens 5, forming a tube.	Lobelia.
stamens 4; plant yellowish-brown.	Epiphegus.

Leaves opposite, not glandular; stamens 4; corolla urn-shaped; lips short.	Scrophularia.
corolla inflated; upper lip arched.	Chelone.
Leaves opposite, glandular; lips nearly equal; stamens 4; inflorescence terminal, spikes slender, acute.	Mentha viridis.
spikes conical, obtuse.	Mentha. piperita.
stamens 2; flowers in axillary whorls.	Lycopus.
upper lip erect; stamens 2, exserted; inflorescence cymose.	Cunila.
stamens 4, exserted; inflorescence spicate.	Hyssopus.
inflorescence corymbose, bracts reddish.	Origanum.
inflorescence clustered, spicate, bracts gray-green.	Majorana.
corolla short, slightly 2-lipped, stamens 4; inflorescence spicate; leaves small, linear.	Thymus (see Leaves).
leaves small, ovate.	Serpyllum.
corolla curved, two-lipped; stamens 4, upper pair shorter; flowers in axillary whorls.	Melissa.
corolla small, two-lipped; filaments 4, only two with anthers.	Hedeoma.
corolla long, with narrow lips; stamens 2; bracts variegated.	Monarda.
upper lip arched; stamens 4, the lower pair shorter; floral leaves bract-like.	Cataria.
flowers in axillary cymules; leaves and floral leaves alike.	Glechoma.
upper lip erect; stamens 4, short; flowers in dense axillary whorls.	Marrubium.
stamens 4, the lower pair longer; calyx lips entire, upper one with helmet-like projection.	Scutellaria.
calyx spiny five-toothed; leaves palmately lobed.	Leonorus.
c. Flowers not in heads; corolla lobes spreading.	
Corolla salver-form; flowers in dense spikes; leaves rosulate.	Plantago.
flowers in pairs; leaves opposite.	Mitchella.
Corolla rotate; leaves in whorls, rough on the margin.	Galium.
leaves opposite; sessile, oblong-ovate, acute (or linear-oblong).	Sabbatia.

obovate-oblong, obtuse.	Centaurium.
ovate, acuminate; drug brown.	Chiretta.
3. Petals absent.	
Leaves digitate; leaflets lanceolate, acute, serrate.	Cannabis.

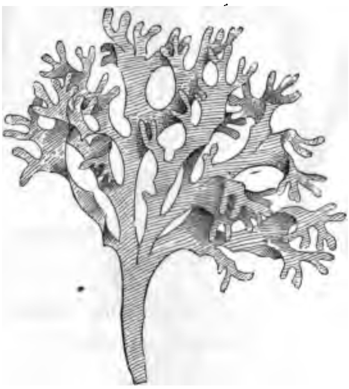
CHONDRUS.—IRISH MOSS, CARRAGEEN.

Origin.—Chóndrus críspus, *Lyngbye,* and Gigartína mamillósa, *Agardh* (Chóndrus mamillósus, *Greville*). *Natural order,* Algæ, Florideæ.

Habitat.—Atlantic Ocean.

Description.—From 5 to 12 centimeters (2 to 5 inches) or more long; yellowish or whitish, horny, translucent, when softened in water cartilaginous, many times forked, segments varying in shape between wedge-shaped and linear, at the apex emarginate or two-lobed; spore vessels imbedded in the frond, in Gig. mamillosa short-stipitate along the channeled branches; odor slight seaweed-like; taste mucilaginous, somewhat saline.

FIG. 170.

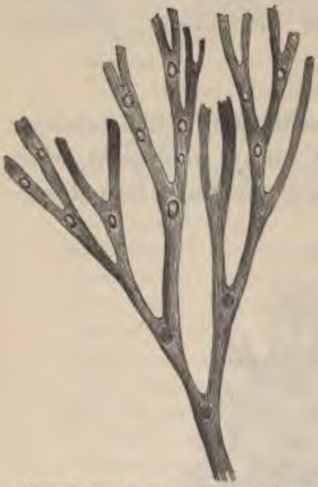


Chondrus crispus.

One part of it boiled for ten minutes with 30 parts of water yields a solution which gelatinizes on cooling.

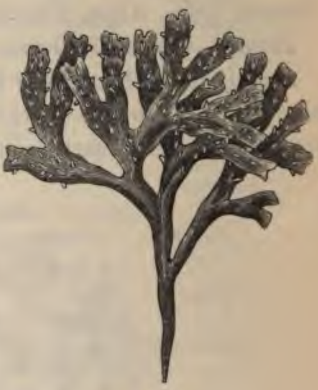
Constituents.—Aside from moisture, consists mainly of mucilaginous compounds, some albuminoids and 8–15 per cent. ash, chiefly chlorides, sulphates, and phosphates, with traces of bromides and iodides.

Fig 171.



Chondrus crispus.—Narrow form, with fruit.

Fig. 172.



Gigartina mamillosa.

Properties.—Demulcent, somewhat nutritive. *Dose*, 4 to 8 grams (ʒj–ij), in decoction or jelly.

FUCUS VESICULOSUS.—Bladder-wrack.

Origin.—Fúcus vesiculósus, *Linné.* *Natural order*, Algæ, Fucoideæ.

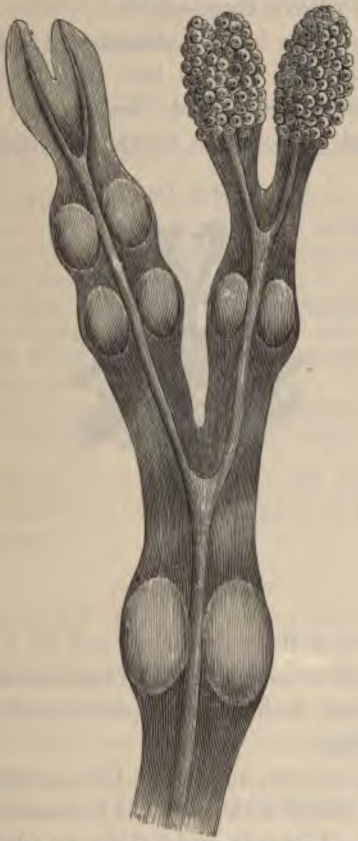
Habitat.—Atlantic Ocean.

Description.—About 1 meter (40 inches) long, and 15 millimeters ($\frac{3}{5}$ inch) broad, flattened, branched, with a midrib and the air-vessels in pairs, blackish; odor like seaweeds; taste mucilaginous, saline.

Fúcus nodósus, *Linné*, is narrow, without midrib, air-vesicles single, otherwise like the preceding.

Constituents.—Organic matter 62, ash 16, moisture 22 per cent. Organic principles: mucilage, mannit, fat, etc. Ash: chlorides, bromides, iodides, phosphates, and sulphates.

FIG. 173.



Fucus vesiculosus, *Linné.*—Fruiting branch, natural size.

Properties.—Alterative. *Dose*, about 8 grams (ʒij), in decoction; recommended in obesity.

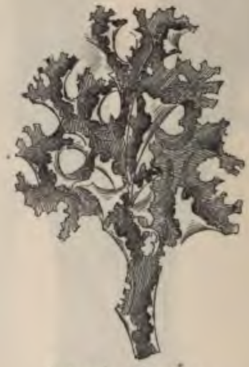
CETRARIA.—ICELAND MOSS.

Origin.—Cetrária islándica, *Acharius.* *Natural order*, Lichenes, Ascomycetes.

Habitat.—Northern Hemisphere.

Description.—Five to 10 centimeters (2 to 4 inches) long, foliaceous, irregularly divided into fringed and channeled lobes, brownish above, whitish beneath and marked with small depressed white spots, brittle and inodorous; when soaked in water, soft cartilaginous and of a slight odor; taste mucilaginous and bitter. When boiled with about 25 parts of water, Iceland moss yields a solution forming a jelly on cooling.

FIG. 174.



Cetraria islandica.

Pine leaves, mosses, and other lichens, which are frequently found mixed with it should be removed.

Constituents.—Lichenin and isolichenin (dextrolichenin), $C_{12}H_{20}O_{10}$, 70 per cent., cetraric acid, $C_{18}H_{16}O_8$, 2 per cent. (crystalline, bitter), lichen-stearic acid, $C_{14}H_{34}O_3$, 1 per cent., fumaric acid, oxalic acid, sugar, cellulose 16 per cent., ash 1–2 per cent. Isolichenin is soluble in cold water, dextrogyre, colored blue by iodine and does not combine with alkalies. Lichenin separates from its hot-water solution as a jelly, is not colored blue by iodine, and combines with bases.

Properties.—Demulcent, tonic, nutritive. *Dose*, 4 to 8 grams (ʒj–ij), in decoction or jelly.

ADIANTUM.—Maidenhair.

Origin.—Adiántum pedátum, *Linné. Natural order*, Filices, Polypodiaceæ.

Habitat.—North America and Eastern Asia; in woods.

Description.—About 30 centimeters (12 inches) high; stipe polished, brown-black, forked at the summit and branched; branches nearly horizontal, each bearing on one side about six linear-lanceolate pinnæ; leaflets triangular-oblong, crenately-toothed on the upper margin; fruit-dots at the apex of the teeth; odor faintly aromatic; taste mucilaginous, sweetish, slightly astringent and bitter.

Constituents.—Mucilage, tannin, bitter principle.

Properties.—Demulcent, expectorant, tonic. *Dose*, 2 to 4 grams (ʒss–j).

Adiántum Capíllus Venéris, *Linné*, is indigenous to Europe and the Southern United States west to California; it is used like the preceding.

PULSATILLA.—Pulsatilla.

Origin.—Anemóne (Anémone) (Pulsatílla, *Miller*) praténsis, *Linné*, An. Pulsatílla, *Linné*, and An. pátens, *Linné*, var. Nuttalliána, *Gray*. *Natural order* Ranunculaceæ, Anemoneæ.

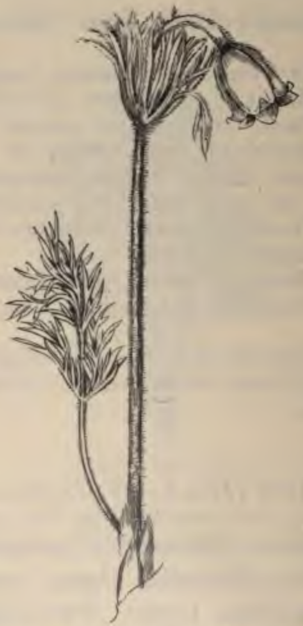
Habitat.—Europe, the variety Nuttalliana in Western North America.

Description. — Leaves radical, petiolate, silky-villous, twice or thrice deeply three-parted or pinnately cleft, with linear acute lobes, appearing after the large purple (or in the last-named species sometimes whitish) flowers; akenes numerous, prolonged into the hairy style; inodorous; very acrid.

The herb should be collected shortly after flowering, carefully preserved, and not kept longer than one year.

Constituents. — Anemonin, $C_{10}H_8O_4$, anemonic acid, $C_{10}H_{10}O_5$, anemoninic acid, $C_{10}H_{12}O_6$, and acrid anemone-camphor. This is oily, crystallizing, not fusible or volatile, but distils from the herb with water; soluble in chloroform; neutral; spontaneously decomposed into anemonin and insoluble isoanemonic acid, $C_{10}H_{10}O_5$. Anemonin is colorless, inodorous, acrid when melted or distilled with

FIG. 175.



Anemone pratensis.—Leaf with flowering scape.

water, sparingly soluble in water and alcohol; may be converted into the two acids named above which are freely soluble in water. (Beckurts, 1892.)

Properties.—Irritant, diuretic, diaphoretic, expectorant, dilating the pupil; poisonous. *Dose*, 0.12 to 0.6 gram (gr. ij–x), in powder, tincture, or extract.

RANUNCULUS.—Crowfoot, Buttercups.

Origin.—Ranúnculus bulbósus, *Linné.* *Natural order*, Ranunculaceæ, Ranunculeæ.

Habitat.—Europe, naturalized in North America, in grassy places.

Description.—Base of stem tuberous; radical leaves with sheathing petioles, ternate, the lateral divisions sessile, rhomboid wedge-shaped, three-cleft, hairy; stem leaves smaller; flowers yellow, five-petalous, with a reflexed calyx, numerous stamens and ovaries, the latter forming akenes with a short curved beak; inodorous; taste very acrid.

Ranúnculus répens, *Linné*, not bulbous; leaflets stalked, three-lobed and toothed; akenes straight-beaked.

Ran. ácris, *Linné*, not bulbous; divisions of the leaves sessile; akenes with a sharp curved beak.

Constituents.—The aqueous distillate yields to chloroform an acrid yellow oil from which anemonin and anemonic acid may be obtained.

Properties.—Irritant, diuretic; externally used as a counterirritant.

COPTIS.—Goldthread.

Origin.—Cóptis trifólia, *Salisbury.* *Natural order*, Ranunculaceæ, Helleboreæ.

Habitat.—Northern continents.

Description.—Rhizome filiform, golden-yellow, with very thin rootlets; leaves radical from a scaly base, petiolate, trifoliate, the leaflets 1 to 2 centimeters (⅖ to ⅘ inch) long, wedge-obovate, obtusely three-lobed and mucronately crenate; flowers single, yellowish; fruit about seven follicles, containing a few black seeds; inodorous, strongly bitter.

Constituents.—Berberine, coptine (white alkaloid, possibly identical with hydrastine), resin, sugar, etc., ash 4–5 per cent.; no tannin.

Properties.—Tonic. *Dose,* 1 to 4 grams (gr. xv–ʒj), in decoction.

CHELIDONIUM.—CELANDINE.

Origin.—Chelidónium május, *Linné.* *Natural order,* Papaveraceæ, Papavereæ.

Habitat.—Europe; naturalized in North America; in waste and cultivated grounds.

Description.—Root several-headed, red-brown; stem about 50 centimeters (20 inches) high, hairy; leaves 10 to 20 centimeters (4 to 8 inches) long, the upper ones sessile, light green above, glaucous beneath, lyrate-pinnatifid, the pinnæ ovate-oblong, obtuse, coarsely crenate or incised, the terminal one often three-lobed; petals 4, yellow; capsule linear, two-valved, one-celled, many-seeded; odor, when fresh, unpleasant; taste acrid. The whole plant contains a saffron-colored milk-juice.

Constituents.—Chelerythrine, $C_{21}H_{17}NO_4$, sanguinarine, $C_{29}H_{15}NO_4$, chelidonine, $C_{20}H_{19}NO_5$, α and β homochelidonine, $C_{21}H_{21}NO_5$, protopine, $C_{20}H_{17}NO_5$, chelidoxanthin (yellow bitter needles), chelidonic (jervic) acid, chelidoninic (ethylene-succinic) acid. Chelerythrine melts at 203° C.; its salts are lemon-yellow. Sanguinarine melts at 211° C.; salts red. The other alkaloids yield white salts and have the following melting points: Chelidonine, 130°; α homochelidonine, 182°; β homochelidonine, 159°, and protopine, 207° C.

Properties.—Diuretic, cathartic. *Dose,* 1 to 4 grams (gr. xv–ʒj), the extract 0.5 to 1 gram (gr. viij–xv); the milk-juice externally as a caustic.

BURSA PASTORIS.—SHEPHERD'S PURSE.

Origin.—Capsélla Bursa-pastóris, *Moench.* *Natural order,* Cruciferæ, Lepidineæ.

Habitat.—Asia and Europe, naturalized in most countries of the temperate zones, in grassy places and along roadsides.

Description.—Very variable. Root annual, thin; radical leaves rosulate, 5 to 10 centimeters (2–4 inches) long, lanceolate, narrowed into a petiole, more or less coarsely toothed or deeply pinnatifid; stem about 15 centimeters (6 inches) high; stem leaves alternate, sessile, clasping with an arrow-shaped base, lanceolate, entire or toothed; flowers small, in corymbose, finally elongated racemes; petals 4, white; stamens 6, tetradynamous; fruit inversely heart-shaped, on spreading peduncles, containing about 20 minute seeds; nearly inodorous; taste acrid, pungent, and bitter.

Constituents.—Little volatile oil (identical with mustard oil), bursic acid (probably glucoside), bitter principle, resin, etc.

Properties.—Hæmostatic, tonic. *Dose*, 1 to 4 grams (gr. xv–ʒj), in tincture.

HELIANTHEMUM.—FROSTWORT.

Origin.—Heliánthemum canadénse *Michaux*, and Heliánthemum corymbósum, *Michaux*. *Natural order*, Cistineæ.

Habitat.—North America, south to Florida, and west to Eastern Texas and Minnesota; in sandy woods and fields.

Description.—About 30 centimeters (12 inches) high; stem rigid, slender, hairy; leaves alternate, entire, elliptic, or linear lanceolate, about 2 centimeters (⅘ inch) long, woolly beneath; flowers of two kinds, the earlier ones single with five large yellow caducous petals; the later ones in hoary clusters, nearly sessile, apetalous; inodorous, bitterish, astringent.

The second species is very similar, but has the stem branched from the base, the leaves narrower, densely tomentose underneath, the flowers all clustered at the summit, the apetalous ones being in glomerate terminal cymes.

Constituents.—Tannin, 11 per cent. bitter principle (probably a glucoside, soluble in water, alcohol, and benzol), sugar, gum, wax, ash 3 per cent.

Properties.—Tonic, astringent, alterative. *Dose*, 0.5 to 2 grams (gr. viij–xxx), in decoction.

HYPERICUM.—ST. JOHN'S WORT.

Origin.—Hypéricum perforátum, *Linné*. *Natural order*, Hypericineæ.

Habitat.—Asia and Europe; naturalized in North America.

Description.—Erect, about 50 centimeters (20 inches) high, smooth; stem somewhat two edged; leaves opposite, sessile, linear-oblong, pellucid-punctate; flowers about 2 centimeters ($\frac{4}{5}$ inch) broad, in terminal cymes, yellow, black-dotted; odor slight, balsamic; taste acrid, bitter.

Constituents.—Resin, tannin, red coloring matter (soluble in alcohol, ether, and oils).

Properties.—Stimulant, discutient; mostly used externally.

POLYGALA.—BITTER POLYGALA.

Origin.—Poly′gala poly′gama, *Walter* (P. rubélla, *Willdenow*). *Natural order*, Polygaleæ.

Habitat.—North America, in grassy places.

Description.—Ascending, smooth, about 20 centimeters (8 inches) high, somewhat branched; leaves alternate, oblanceolate or lance-linear, mucronate; inflorescence racemose; flowers purple, the keel crested and shorter than the wings; capsule ovate-oblong, two-seeded, the seeds with a scale-like crest; bitter.

Constituents.—Bitter principle.

Properties.—Tonic.

MELILOTUS.—SWEET CLOVER.

Origin.—Melilótus altíssimus, *Thuilliers* (M. officinális, *Willdenow*), and Mel. álbus, *Desrousseaux*. *Natural order*, Leguminosæ, Papilionaceæ, Genisteæ.

Habitat.—Europe, naturalized in North America.

Description.—Erect, about 1.2 meters (4 feet) high, smooth, much branched; stipules entire, awl-shaped; leaves alternate, trifoliate; leaflets oval or obovate-oblong, sharply serrate, near the base entire; flowers small, yellow or white, racemose; legumes small, wrinkled, few-seeded; odor fragrant, stronger on drying; taste aromatic, somewhat pungent and bitter.

Constituents.—Coumarin (see Dipterix), melilotol (fragrant, volatile oil), cumaric acid, $C_9H_8O_3$ (sublimable, soluble in alcohol, ether, and hot water), melilotic (hydrocumaric) acid, $C_9H_{10}O_3$ (strongly acid; odor honey-like).

Properties.—Stimulant, discutient; mostly used externally.

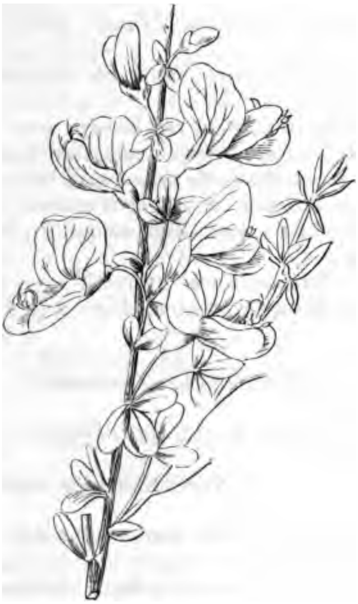
SCOPARIUS.—Broom.

Origin.—Cy'tisus (Sarothámnus, *Koch*) scopárius, *Link*. *Natural order*, Leguminosæ, Papilionaceæ, Genisteæ.

Habitat.—Western Asia, Southern and Western Europe; naturalized in some localities in the United States.

Description.—Thin flexible twigs, pentangular, winged, nearly smooth, tough, usually free from leaves, which are small trifoliate, the leaflets obovate-oblong, entire; flowers racemose, showy, yellow, with ten monadelphous stamens; odor, when bruised, peculiar; taste disagreeably bitter.

Fig. 176.



Sarothamnus scoparius; flowering branch.

Constituents.—Volatile oil, scoparin, $C_{21}H_{22}O_{10}$ (tasteless, amorphous), sparteine, $C_{15}H_{26}N_2$, tannin, fat, wax, sugar, ash 5–6 per cent. Sparteine is colorless, oily, very bitter, soluble in alcohol, ether, and chloroform, sparingly so in water, insoluble in benzol; narcotic; the sulphate in prisms, freely soluble in water; the hydriodide in plates, freely soluble in alcohol, less so in cold water.

Properties.—Diuretic, somewhat narcotic, in large doses emetic. *Dose,* 1 to 2 grams (gr. xv–xxx), in decoction.

SPIRÆA.—HARDHACK.

Origin.—Spiræ'a tomentósa, *Linné.* *Natural order,* Rosaceæ, Spiræeæ.

Habitat.—North America, south to Georgia and west to Minnesota.

Description.—Stem slender, red-brown, woody; leaves alternate, lance-ovate, serrate, rusty tomentose beneath; inflorescence racemose paniculate; flowers small with 5 purplish-red petals, numerous stamens and 4 or 5 ovaries, producing one-seeded woolly follicles; odor slight aromatic; taste astringent, somewhat bitter.

Constituents.—Tannin, bitter principle.

Properties.—Astringent, tonic. *Dose,* 2 to 4 grams (ʒss–j).

AGRIMONIA.—AGRIMONY.

Origin.—Agrimónia Eupatória, *Linné.* *Natural order,* Rosaceæ, Poterieæ.

Habitat.—Europe and North America, west to Colorado; in grassy places.

Description.—Erect, hairy; stem about 60 centimeters (2 feet) high, roundish angular, nearly simple; leaves alternate, petiolate, pinnate, with clasping serrate stipules, and about 6 pairs of elliptic oblong coarsely toothed leaflets with several pairs of minute ones; inflorescence slender, racemose; calyx persistent, with hooked bristles; petals 5, small, yellow; stamens about 10; fruit one or two akenes; odor faintly aromatic; taste mildly bitter and astringent.

Constituents.—Tannin, bitter principle.

Properties.—Tonic, astringent. *Dose,* 2 to 4 grams (ʒss–j).

POTENTILLA.—CINQUEFOIL.

Origin.— Potentílla canadénsis, *Linné.* *Natural order,* Rosaceæ, Potentilleæ.

Habitat.—North America, in sandy soil.

Description.—Ascending, with slender runners, more or less soft-hairy, leaves petiolate, digitate, the five leaflets obovate or oblanceolate, incised above; flowers axillary, stalked; calyx five-cleft; petals 5, yellow; stamens, ovaries, and akenes numerous; inodorous, astringent.

Constituents.—Tannin.

Properties.—Astringent, vulnerary. *Dose,* 2 to 4 grams (ʒss–j), in infusion.

ŒNOTHERA.—EVENING PRIMROSE.

Origin.—Œnothéra biénnis, *Linné.* *Natural order,* Onagrarieæ.

Habitat.—North America, in fields; naturalized in Europe.

Description.—Erect, hairy, branched; leaves alternate, short-petiolate, ovate oblong or oblong-lanceolate, acute, slightly toothed; inflorescence spicate, leafy; calyx superior, the four lobes reflexed; petals four, showy, light yellow, obcordate; stamens 8; capsule sessile, roundish four-sided, about 3 centimeters (1⅕ inches) long; seeds numerous; taste mildly astringent.

Constituents.—Mucilage, tannin.

Properties.—Alterative, astringent. *Dose,* 2 to 4 grams (ʒss–j).

EPILOBIUM.—WILLOW HEBB.

Origin.—Epilóbium angustifólium, *Linné.* *Natural order,* Onagrarieæ.

Habitat.—Northern Hemisphere, in low grounds and open woodlands.

Description.—Erect, smooth, about 1 meter (40 inches) high; leaves subsessile, alternate, lanceolate, pointed, nearly entire, pale green beneath; inflorescence racemose; calyx superior, four-lobed; petals 4, purplish or pink, showy; stamens 8; capsule linear, about 5 centimeters (2 inches) long, somewhat curved; seeds numerous, with a tuft of hairs; taste mucilaginous, astringent.

Constituents.—Mucilage, tannin, etc.

Properties.—Demulcent, astringent. *Dose,* 2 to 4 grams (ʒss–j).

VIOLA TRICOLOR.—PANSY, HEART'S EASE.

Origin.—Vióla trícolor, *Linné.* *Natural order,* Violarieæ.

Habitat.—Europe, North America, and Northern Asia; cultivated; but the wild-grown plant alone should be collected.

Description.—Stem 10 to 30 centimeters (4 to 12 inches) high, angular, nearly smooth; leaves alternate, petiolate, ovate or oblong, obtuse, crenate, the lower ones roundish-ovate and somewhat heart-shaped; stipules leaf-like, pinnatifid, the lateral lobes linear and entire, the terminal one lance-ovate and crenate; flowers long-peduncled, petals shorter or longer than the calyx, variegated, the lateral ones bearded, forming one obtuse spur; inodorous; taste mucilaginous, somewhat bitter and acrid.

Constituents.—Mucilage, sugar, salicylic acid 0.1 per cent., bitter principle, resin, etc.

Properties.—Alterative, expectorant, in large doses emetic. *Dose,* 1 to 4 grams (gr. xv–ʒj), in decoction or extract.

DROSERA.—SUNDEW.

Origin.—Drósera rotundifólia, *Linné.* *Natural order,* Droseraceæ.

Habitat.—North America (west to Minnesota) and Europe, in boggy places.

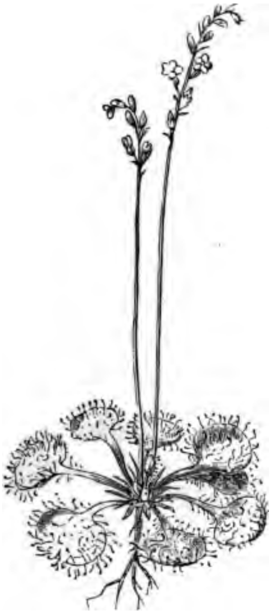
Description.—Leaves radical, rosulate, petiolate, orbicular, about 8 millimeters (⅓ inch) broad; fleshy, with purple glandular bristles; scape slender; inflorescence racemose, one-sided; flowers small, whitish; inodorous; taste acidulous, acrid, and bitter.

Drósera intermédia, *Hayne,* has spatulate leaves.

Constituents.—Citric acid, acrid resin, etc.

Properties.—Pectoral, rubefacient.

FIG. 177.



Drosera rotundifolia.

CACTUS.—NIGHT-BLOOMING CEREUS.

Origin.—Cáctus (Céreus, *Miller*) grandiflórus, *Linné*. *Natural order*, Cactaceæ, Echinocacteæ.

Habitat.—Tropical America; cultivated.

Description.—The fresh flowering branches are used Branches weak, fleshy, five- or six-angled., on the edges with clusters of 5 or 6 spines; flowers sessile, large, fragant; calyx imbricate, brownish and yellow; corolla white; petals and stamens numerous; fruit berry-like; taste acrid.

Constituents.—No analysis.

Properties.—Vermifuge, emetic, cathartic. *Dose*, 0.3 gram (gr. v), in fluid extract or tincture.

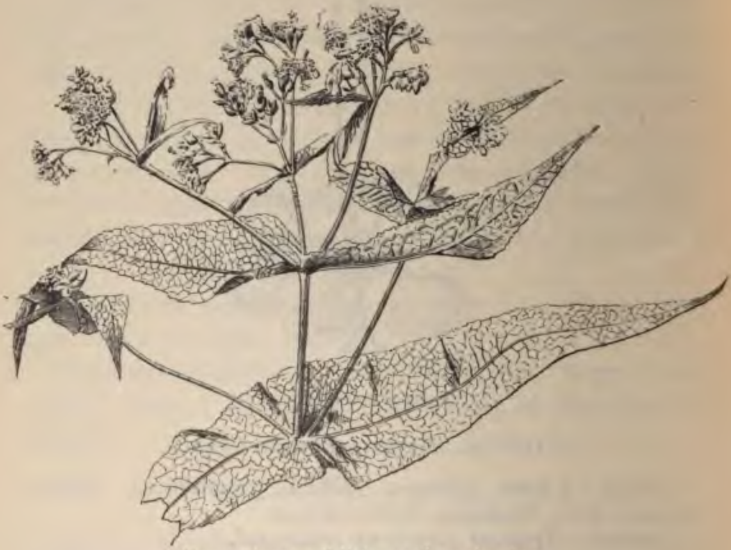
EUPATORIUM.—THOROUGHWORT, BONESET.

Origin.—Eupatórium perfoliátum, *Linné*. *Natural order*, Compositæ, Eupatoriaceæ.

Habitat.—North America, west to Dakota; in low grounds.

Description.—Leaves opposite, united at base, lanceolate, 10 to 15 centimeters (4 to 6 inches) long, tapering, crenately serrate, rugosely veined, rough above, downy and resinous dotted beneath; flower heads corymbed, numerous, with an oblong involucre of lance-linear scales, and with 10 to 15 tubular white florets, having a bristly pappus in a single row; odor aromatic, weak; taste astringent and strongly bitter.

Fig. 178.



Eupatorium perfoliatum; flowering top.

Constituents.—Eupatorin (bitter glucoside, crystallizable, soluble in water, alcohol, ether, and chloroform), volatile oil, crystalline wax, resin, tannin, gum, sugar, ash 7.5 per cent.

Properties. — Stimulant, tonic, diaphoretic, laxative, emetic. *Dose,* 2 to 4 grams (ʒss–j), in infusion or fluid extract.

ERIGERON.—Erigeron, Fleabane, Scabious.

Origin.—Erígeron philadélphicus, *Linné,* Erígeron ánnuus, *Persoon,* and Erígeron strigósus, *Muhlenberg.* *Natural order,* Compositæ, Asteroideæ.

Habitat.—North America, in fields and pastures.

Description.—The three plants are similar in aspect; erect and hairy. Radical leaves petiolate, ovate, or lanceolate, coarsely toothed, serrate, or (E. strigosus) nearly entire; stem leaves smaller, alternate, petiolate, the upper ones sessile, somewhat toothed or entire; all hairy; flower-heads corymbose, with the involucral scales narrow and nearly equal, the receptacle flattish and naked, the ray florets numerous, narrow, in one or two rows, purplish or white, and the disk florets numerous, tubular, and yellow; pappus bristly, simple (E. philadelphicus) or double (the other two species); odor slightly aromatic; taste bitterish, astringent.

Constituents.—Volatile oil a trace, bitter principle, tannin.

Properties.—Diuretic, diaphoretic, tonic. *Dose,* 2 to 4 grams (ʒss–j), in infusion.

ERIGERON CANADENSE.—Canada Erigeron.

Origin.—Erígeron canadénsis, *Linné.* *Natural order,* Compositæ, Asteroideæ.

Habitat.—North America, in fields and waste places; naturalized in other countries.

Description.—Bristly-hairy and erect; leaves alternate, sessile, lance-linear, nearly entire; flower-heads in corymbose panicles, numerous, small, with a cylindrical involucre, inconspicuous ray florets, and a straw-colored bristly pappus; odor aromatic; taste bitterish, somewhat acrid and astringent.

Constituents.—Volatile oil about 1 per cent. of fresh plant, bitter principle, tannin. The volatile oil has spec. grav. 0.864, is soluble in alcohol, polarizes to the left and becomes thick and brown by age.

Properties.—Stimulant, tonic, diuretic, styptic. *Dose,* 2 to 4 grams (ʒss–j), in infusion.

SOLIDAGO.—GOLDEN ROD.

Origin.—Solidágo odóra, *Aiton.* *Natural order*, Compositæ, Asteroideæ.

Habitat.—North America, south to Florida, and west to Kentucky; border of woods and fields.

Description.—Erect; leaves smooth, sessile, linear-lanceolate, 3 to 5 centimeters (1 to 2 inches) long, entire, acute, pellucid-punctate; flower-heads small, numerous, in one-sided recurved racemes, with a yellowish scaly appressed involucre, several yellow florets and bristly pappus; odor and taste sweet, anise-like.

Constituents.—Volatile oil, probably containing anisol.

Properties.—Stimulant, carminative, diaphoretic. *Dose*, 2 to 8 grams (ʒss–ij), in infusion.

GRINDELIA.—GRINDELIA.

Origin.—Grindélia robústa, *Nuttall.* *Natural order*, Compositæ, Asteroideæ.

Habitat.—North America, west of the Rocky Mountains, in salt marshes.

Description.—The leaves and flowering tops are collected. Leaves thickish, varying from broadly spatulate or oblong to lanceolate, sessile or clasping, about 5 centimeters (2 inches) or less long, rather acute, more or less serrate, light green, smooth, finely dotted, and brittle; heads many-flowered; the involucre hemispherical, about 15 millimeters ($\frac{3}{5}$ inch) broad, composed of numerous imbricated, strongly squarrose and often resinous scales; ray-florets yellow, ligulate, pistillate; disk-florets yellow, tubular, perfect; pappus consisting of about three awns of the length of the disk-florets; odor balsamic; taste pungently aromatic and bitter.

Constituents.—Little volatile oil, resin; possibly a peculiar glucoside and alkaloid; besides fat, wax, sugar, gum, little tannin, ash 7–8 per cent.

Properties.—Sedative, in asthma, etc.; externally in rhus poisoning. *Dose,* 2 to 4 grams (gr. xv–ʒj), in tincture or fluid extract.

GRINDELIA SQUARROSA.—Squarrose Grindelia.

Origin.—Grindélia squarrósa, *Dunal. Natural order,* Compositæ, Asteroideæ.

Habitat.—Western plains to the Sierra Nevada and south to Texas.

Description.—Stem about 0.4 meter (16 inches) high, branched, yellowish, smooth; leaves rigid, somewhat petiolate below, sessile and half clasping above, oblong-spatulate or linear-oblong, sharply and sometimes laciniately serrate, pale green, dotted; heads many-flowered, somewhat conical; involucre strongly squarrose; florets yellow, rays sometimes wanting; akenes truncate, with a two- or three-awned pappus; odor balsamic; taste aromatic and bitter.

Constituents.—Little volatile oil, resin, fat, wax, sugar, gum, possibly a bitter glucoside, ash about 5 per cent.

Properties.—Tonic, sedative, in asthma, rheumatism, etc. *Dose,* 1 to 4 grams (gr. xv–ʒj), in tincture or fluid extract.

HELENIUM.—Sneezewort.

Origin.—Helénium autumnále, *Linné. Natural order,* Compositæ, Helenioideæ.

Habitat.—North America, across the continent, in thickets.

Description.—Erect, nearly smooth; stem about 1.2 meters (4 feet) high, quadrangular, winged; leaves sessile, alternate, lanceolate, pointed, serrate; flower-heads numerous with a two-rowed involucre, a naked hemispherical receptacle, long yellow pistillate ray-florets, yellow perfect disk-florets, and top-shaped akenes having a pappus of 5 awned scales; taste bitter, acrid.

Constituents.—Bitter glucoside, resin, malic acid, little tannin, etc.

Properties.—Diaphoretic, errhine.

COTULA.—Mayweed, Wild Chamomile.

Origin—A′nthemis (Marúta, *De Candolle*) Cótula, *Linné. Natural order,* Compositæ, Anthemideæ.

Habitat.—Europe, naturalized in North America; in fields and waste places.

Description.—Nearly smooth, pale green; stem ascending, branched, furrowed; leaves sessile, thrice pinnatifid with linear subulate segments; flower-heads terminal with a conical chaffy receptacle, white ligulate neutral rays, yellow perfect disk-florets, and obovoid akenes without pappus; odor unpleasant aromatic; taste bitter, acrid.

Constituents.—Volatile oil, valerianic acid, acrid fat, tannin, anthemidine (?), anthemic acid (crystalline, bitter, soluble in ether).

Properties.—Stimulant, antispasmodic, sudorific. *Dose*, 2 to 8 grams (ʒss–ij), in infusion.

ACHILLEA.—Yarrow, Milfoil.

Origin.—Achilléa Millefólium, *Linné*. *Natural order*, Compositæ, Anthemideæ.

Habitat.—Northern temperate zone, in fields.

Description.—Erect, hairy; leaves nearly sessile, lanceolate in outline, glandular beneath, 5 to 25 centimeters (2 to 10 inches) long, thrice pinnatifid, with linear spatulate toothed segments; flower-heads corymbed, with an oblong imbricate involucre, flat chaffy receptacle, five short white pistillate rays, greenish-white perfect disk-florets, and oblong flat akenes without pappus; odor somewhat chamomile-like; taste bitter aromatic.

Constituents.—Volatile oil 0.1 per cent. (blue or dark green), achilleine, $C_{20}H_{38}N_2O_{15}$ (amorphous, bitter, soluble in water and alcohol, insoluble in ether), resin, tannin, aconitic acid; ash about 13 per cent.

Properties.—Stimulant, tonic, emmenagogue. *Dose*, 2 to 4 grams (ʒss–j), in infusion.

PARTHENIUM.—Feverfew.

Origin.—Chrysánthemum (Pyréthrum, *Smith*; Matricária, *Linné*) Parthénium, *Persoon*. *Natural order*, Compositæ, Anthemideæ.

Habitat.—Europe, cultivated.

Description.—Erect, pubescent; leaves alternate, petiolate, broadly ovate, bipinnatifid, the segments oblong, obtuse, and somewhat toothed; flower-heads in terminal cymes, with a two-rowed involucre, a naked hemispherical receptacle, white ligulate and obtusely three-toothed rays, and yellow tubular disk-florets; odor and taste chamomile-like, bitter.

Constituents.—Volatile oil, bitter principle, tannin.

Properties.—Stimulant, tonic. *Dose,* 1 to 4 grams (gr. xv–ʒj).

TANACETUM.—TANSY.

Origin.—Tanacétum vulgáre, *Linné.* *Natural order,* Compositæ, Anthemideæ.

Habitat.—Asia and Europe; naturalized in North America; cultivated.

Description.—The leaves and flowering tops are collected. Stem erect, striate, smooth; leaves alternate, nearly sessile, about 15 centimeters (6 inches) long, pinnatifid, the segments oblong, obtuse, sharply serrate or incised, dark green, smooth and glandular; flower-heads corymbose, with an imbricated involucre, a convex naked finely pitted receptacle, numerous yellow tubular florets, those of the ray with a short three-lobed margin, and obovate akenes having a short crown; odor strongly aromatic; taste pungent and bitter.

Constituents.—Volatile oil· ¼ per cent. (spec. grav. 0.95, yellow or green, freely soluble in alcohol), tanacetin (bitter, granular, precipitated by tannin, insoluble in ether), fat, resin, tannin, mucilage, sugar, tartrates, citrates, and malates.

Properties.—Stimulant, tonic, anthelmintic, diuretic, emmenagogue. *Dose,* 1 to 4 grams (gr. xv–ʒj), in infusion.

ABSINTHIUM.—WORMWOOD.

Origin.—Artemísia Absínthium, *Linné.* *Natural order,* Compositæ, Anthemideæ.

Habitat.—Northern Asia, Europe, and Northern Africa; naturalized in North America; cultivated.

Description.—The leaves and flowering tops are collected. Leaves petiolate, about 5 centimeters (2 inches) long, silky-hoary, roundish-triangular in outline, twice or thrice pinnatifid, the segments lanceolate, the terminal one spatulate; flower-heads numerous, racemose, small, subglobose, with an imbricated bell-shaped involucre, a small hairy convex receptacle, small tubular yellowish florets, and obovoid akenes without pappus; odor aromatic; taste very bitter.

Constituents.—Volatile oil about 1 per cent. (spec. grav. 0.92, dark green, becoming brown, freely soluble in alcohol, mainly absinthol, $C_{10}H_{16}O$), absinthin, $C_{15}H_{20}O_4$ (bitter glucoside, amorphous, white, soluble in ether, alcohol, and cold water; with acids yields dextrose, a resinous compound, and a volatile odorous body), tannin, resin, succinic acid, malates, nitrates, ash 7 per cent.

Properties.—Stimulant, tonic, febrifuge, anthelmintic. *Dose,* 1 to 4 grams (gr. xv–ʒj), in infusion, tincture, or extract.

ARTEMISIA.—MUGWORT.

Origin.—Artemísia vulgáris, *Linné.* *Natural order,* Compositæ, Anthemideæ.

Habitat.—Asia, Europe, naturalized in North America.

Description.—Stem often reddish, branched; leaves subsessile, green above, white tomentose beneath, pinnatifid, segments lanceolate, acute, incised or entire; flower-heads numerous, small, nearly sessile, ovate, with an imbricated involucre, a small smooth receptacle and tubular reddish florets; odor aromatic; taste bitter.

Constituents.—Volatile oil, bitter principle, tannin, etc.

Properties.—Stimulant, tonic. *Dose,* 1 to 4 grams (gr. xv–ʒj), in infusion.

GNAPHALIUM.—LIFE EVERLASTING.

Origin.—Gnaphálium polycéphalum, *Michaux.* *Natural order,* Compositæ, Inuloideæ.

Habitat.—North America, from the Atlantic region southwestward to Texas and Mexico; in fields and woods.

Description.—Erect, about 25 centimeters (10 inches) high, densely woolly; leaves sessile, lanceolate; flower-heads in dense terminal clusters, small, obovate, with a whitish imbricate involucre and tubular yellowish florets; odor agreeable; taste bitterish, aromatic.

Gnaphálium margaritáceum, *Linné*, has larger, globular-ovate, pearl-white heads and a slight odor.

Constituents.—Volatile oil, bitter principle.

Properties.—Diaphoretic, astringent, tonic. *Dose*, 2 to 4 grams (ʒss–j).

CALENDULA.—MARIGOLD.

Origin.—Caléndula officinális, *Linné*. *Natural order*, Compositæ, Calendulaceæ.

Habitat.—Levant and Southern Europe; cultivated.

Description.—Stem about 50 centimeters (20 inches) high, somewhat angular, rough, leaves alternate, thickish, after drying thin, hairy, spatulate or oblanceolate, entire or slightly toothed, the upper ones sessile and amplexicaul; involucre hemispherical, receptacle flat, naked; ray-florets in one or several rows, fertile, the akenes incurved and muricate on the back, those of the outer row winged; odor somewhat narcotic; taste bitter and saline.

Caléndula arvénsis, *Linné*, which is frequently cultivated, is rather smaller and more spreading, has light yellow flowers and nearly straight akenes in the outer row, and resembles the former in odor and taste.

Constituents.—A trace of volatile oil, amorphous bitter principle, tasteless yellow calendulin, sugar, gum, etc.

Properties.—Stimulant, resolvent, vulnerary, alterative. *Dose*, 0.5 to 1 or 2 grams (gr. viij–xv–xxx), in infusion, tincture, or extract.

CARDUUS BENEDICTUS.—BLESSED THISTLE.

Origin.—Cnícus benedíctus, *Gærtner* (Centauréa benedícta, *Linné*). *Natural order*, Compositæ, Cynaroideæ.

Habitat.—Levant and Europe, rare in the United States.

Description.—Erect, somewhat woolly; leaves sessile above and somewhat decurrent, alternate, lance-oblong, sinuately lobed, soft spiny; flower-heads ovate, about 25 millimeters (1 inch) long, with an imbricate squarrous spinously-pointed involucre, a flat hispid receptacle, tubular yellow florets and grayish akenes, crowned with ten teeth and with ten long and ten short bristles; odor slight, of the fresh herb disagreeable; taste very bitter.

Constituents.—Cnicin (bitter needles, slightly soluble in cold water and ether), tannin, malates, calcium oxalate.

Properties.—Diaphoretic, tonic. *Dose*, 1 to 4 grams (gr. xv–ʒj).

LOBELIA.—LOBELIA, INDIAN TOBACCO.

Origin.—Lobélia infláta, *Linné.* *Natural order*, Campanulaceæ, Lobelieæ.

Habitat.—North America, in fields and open woods.

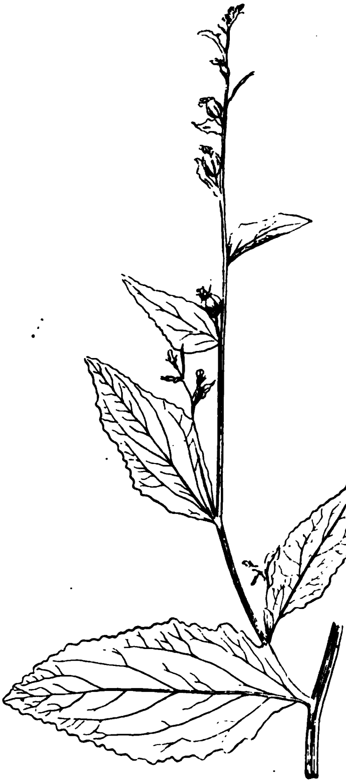
Description.—Erect; leaves alternate, petiolate, the upper sessile, ovate or oblong, about 5 centimeters (2 inches) long, irregularly toothed, pubescent, pale green; branches furrowed, hairy, terminating in long racemes of small pale blue flowers, having a superior narrowly five-toothed calyx, which is inflated in fruit, a pale blue two-lipped corolla, and 5 united stamens; odor slight, irritating; taste mild, afterward burning and acrid.

The leaves and flowering tops should be collected after a portion of the capsules are ripe, and contain a large number of minute reticulate seeds.

Constituents.—Lobeline (white powder, inodorous, soluble in most simple solvents, acrid, the salts not crystalline, freely soluble in water), a second alkaloid (?), inflatin (tasteless crystals, probably wax), lobelacrin (probably lobelate of lobeline), lobelic acid (precipitated by copper sulphate, olive-brown by ferric salts), resin, wax, volatile oil, gum.

Properties.—Expectorant, nervine, purgative, emetic, narcotic. *Dose,* 0.12, 0.5 to 2 grams (gr. ij–viij–xxx), in powder, infusion, or tincture.

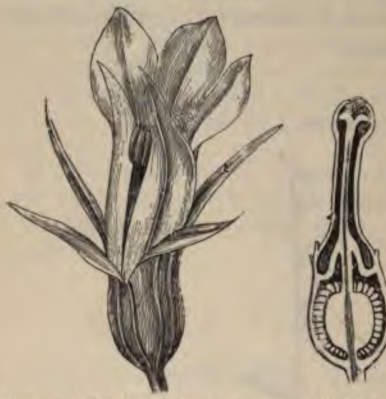
FIG. 179.



Lobelia inflata; branch with flowers and fruit.

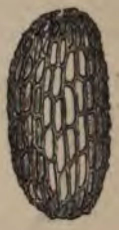
Antidotes. — Astringents; stimulants; application of warmth.

FIG. 180.



Flower of lobelia and section, magnified 5 diam.

FIG. 181.



Lobelia seed.—Highly magnified.

EPIPHEGUS.—BEECHDROP.

Origin.—Epiphégus virginiána, *Barton.* *Natural order,* Orobanchaceæ.

Habitat.—North America, west to Wisconsin and Arkansas; parasitic upon roots of the beech.

Description.—Erect, branched, about 40 centimeters (16 inches) high, yellowish brown, tuberous at base, angular above; leaves scaly, ovate; flowers in spicate racemes, the upper sterile ones with a somewhat curved and two-lipped corolla; taste bitter, somewhat astringent.

Constituents.—Bitter principle, tannin.

Properties.—Astringent, depurative. *Dose,* 2 to 4 grams (ʒss–j).

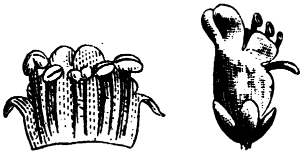
SCROPHULARIA.—FIGWORT.

Origin.—Scrophulária nodósa, *Linné.* *Natural order,* Scrophulariaceæ, Cheloneæ.

Habitat.—North America (west to Mississippi, Utah, and Oregon) and Europe; in moist thickets.

Description.—Erect; smooth; stem obtusely quadrangular; leaves opposite, petiolate, ovate-oblong or lanceolate, serrate, rounded or heart-shaped at base; inflorescence loosely paniculate; corolla greenish-brown, hemispherical urn-shaped, the five teeth roundish-obtuse, the two upper ones larger and brown, the lowest one spreading; stamens 4, short, the fifth sterile; capsule two-celled, many-seeded; taste bitter, nauseous.

FIG. 182.



Scrophularia; flower and corolla cut open.

Constituents.—Scrophularin (crystalline scales, bitter, precipitated by tannin), alkaloid (from the root in minute quantity), scrophularosmin (stearopten), tannin, gum, pectin, resin, starch, salts.

Properties.—Depurative, vulnerary.

CHELONE.—BALMONY.

Origin.—Chelóne glábra, *Linné.* *Natural order*, Scrophulariaceæ, Cheloneæ.

Habitat.—North America, west to Minnesota and Texas; in wet places.

Description.—Erect, smooth; leaves short-petiolate, opposite, oblong-lanceolate, pointed, serrate; inflorescence spicate, terminal; corolla about 3 centimeters (1⅕ inches) long, white or pinkish, bilabiate, the upper lip arched, the mouth somewhat gaping; capsule two-celled; seeds many, winged; inodorous, bitter.

Constituents.—Bitter principle.

Properties.—Tonic, laxative, anthelmintic. *Dose*, 2 to 8 grams (ʒss–ij), in decoction.

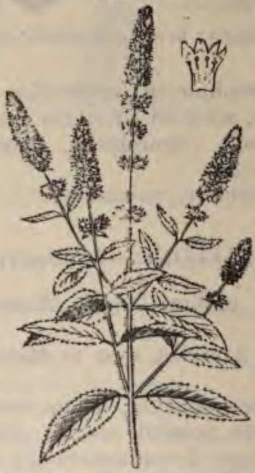
MENTHA PIPERITA.—PEPPERMINT.

Origin.—Méntha piperíta, *Linné.* *Natural order*, Labiatæ, Satureineæ.

Habitat.—Wild in Asia, Europe, and North America; cultivated.

Description.—The leaves and tops are collected. Leaves petiolate, ovate-lanceolate, about 5 centimeters (2 inches) long, acute, sharply serrate, glandular, nearly smooth; branches quadrangular, often purplish; flowers in terminal conical spikes, with a tubular, five-toothed, often purplish calyx, a purplish four-lobed corolla, and 4 short stamens; aromatic; taste pungent and cooling.

Fig. 183.



Mentha piperita, *Linné*, flowering tops.

Constituents.—Volatile oil about 1 per cent., little tannin, resin, gum, etc. The volatile oil has the spec. grav. 0.91, is freely soluble in alcohol, and consists of little terpene (boiling at 160° C.), of liquid $C_{10}H_{18}O$, and of crystalline menthol, $C_{10}H_{20}O$.

Properties.—Carminative, stimulant, nervine, stronger than spearmint. *Dose*, 1 to 4 grams (gr. xv–ʒj), in infusion.

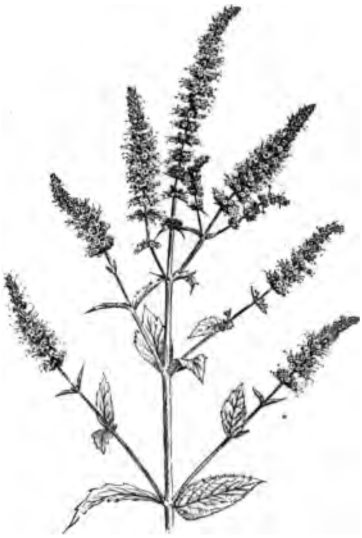
MENTHA VIRIDIS.—Spearmint.

Origin.—Méntha víridis, *Linné*. *Natural order*, Labiatæ, Satureineæ.

Habitat.—Wild in Europe and North America; cultivated.

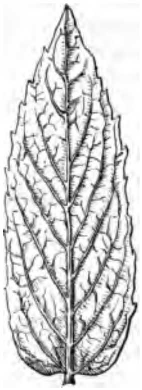
Description.—The leaves and flowering tops are collected. Leaves subsessile, lance-ovate, about 5 centimeters (2 inches) long, acute, serrate, glandular, nearly smooth; branches quadrangular, mostly light green; flowers in terminal, interrupted, narrow, acute spikes, with a tubular sharply five-toothed calyx, a light purplish four-lobed corolla, and 4 exserted or included stamens; aromatic and pungent.

FIG. 184.



Mentha viridis, *Linné*, flowering tops.

FIG. 185.



Spearmint leaf, natural size.

Constituents.—Volatile oil about ½ per cent., resin, gum, etc. The volatile oil has the spec. grav. 0.91, is freely soluble in alcohol, and consists of $C_{10}H_{16}$ (boiling-point 160° C.), and of carvol, $C_{10}H_{14}O$.

Properties.—Carminative, stimulant, nervine. *Dose*, 2 to 4 grams (ʒss–j), in infusion.

LYCOPUS.—Bugle.

Origin.—Ly′copus (Lycópus) virgínicus, *Linné. Natural order*, Labiatæ, Satureineæ.

Habitat.—North America, south to Florida and Missouri, and west to Oregon; in moist shady places.

Description.—Stem obtusely quadrangular, with slender runners; leaves about 5 centimeters (2 inches) long, short-petioled, elliptic-lanceolate, toothed above, smooth; flowers in axillary clusters, small, with a bluntly four-toothed calyx, a purplish four-lobed corolla, and two fertile stamens; odor somewhat mint-like; taste bitter.

Ly′copus sinuátus, *Elliott*, also indigenous to North America, and extending across the continent, has a sharply quadrangular stem, the leaves sinuate-toothed or pinnatifid at the base, and a sharply five-toothed calyx. It is closely related to L. europæ′us, *Linné.*

Constituents.—Volatile oil, bitter principle, tannin.

Properties.—Astringent, tonic, sedative. *Dose*, 0.5 to 2 grams (gr. viij–xxx), in infusion.

CUNILA.—Dittany.

Origin.—Cunı́la Mariána, *Linné. Natural order*, Labiatæ, Satureineæ.

Habitat.—United States, south to Georgia and Arkansas; in dry soil.

Description.—Stem thin; leaves nearly sessile, about 25 millimeters (1 inch) long, ovate, serrate, subcordate; flowers in small cymes, with an ovate-tubular calyx, a two-lipped, pale purple corolla, and 2 exserted stamens; odor mint-like; taste pungent aromatic.

Constituents.—Volatile oil.

Properties.—Carminative, stimulant, sudorific. *Dose*, 1 to 4 grams (gr. xv–ʒj), in infusion.

HYSSOPUS.—Hyssop.

Origin.—Hyssópus officinális, *Linné. Natural order*, Labiatæ, Satureineæ.

Habitat.—Southern Europe; naturalized in the United States; cultivated.

Description.—Stem branched, wand-like; leaves sessile, about 25 millimeters (1 inch) long, linear-lanceolate, rather obtuse; flowers in small clusters, with a five-toothed calyx, a two-lipped, purple corolla, and 4 exserted didynamous stamens; aromatic, pungent, bitterish.

Constituents.—Volatile oil about $\frac{1}{2}$ per cent., bitter principle, tannin, etc.

Properties.—Carminative, stimulant, sudorific. *Dose*, 1 to 4 grams (gr. xv–ʒj), in infusion.

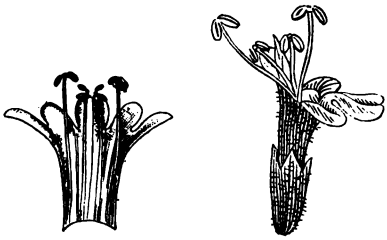
ORIGANUM.—Wild Marjoram.

Origin.—Oríganum vulgâre, *Linné.* *Natural order*, Labiatæ, Satureineæ.

Habitat.—Asia, Europe, and Northern Africa; naturalized in North America in some of the Atlantic States.

Description.—Stem roundish, purplish, short-hairy, branched above; leaves petiolate, about 2 centimeters ($\frac{4}{5}$ inch) long, roundish-ovate, obtuse, nearly entire, hairy beneath; flowers corymbose, with reddish bracts, a five-toothed calyx, a somewhat two-lipped, pale-purple corolla, and 4 exserted didynamous stamens; aromatic, pungent, bitterish.

Fig. 186.



Origanum vulgare; flower and corolla, magnified.

Constituents.—Volatile oil about 1 per cent. (spec. grav. 0.89, light yellow, neutral, bitterish, not freely soluble in

80 per cent. alcohol, contains oxygen), tannin, bitter principle, resin.

Properties. — Carminative, stimulant, emmenagogue. *Dose,* 1 to 4 grams (gr. xv–ʒj), in infusion.

MAJORANA.—SWEET MAJORAM.

Origin.— Oríganum Majorána, *Linné.* *Natural order,* Labiatæ, Satureineæ.

Habitat.—Asia Minor and Southern Europe; cultivated.

Description.—Stem branched, subterete; leaves sessile above, about 15 millimeters (⅗ inch) long, spatulate or obovate, obtuse, entire, gray-green, soft hairy; flowers in clusters, spicate, with a two-lipped calyx, a whitish, somewhat two-lipped corolla, and 4 exserted didynamous stamens; fragrantly aromatic and pungent.

Constituents.—Volatile oil (spec. grav. 0.89, readily soluble in alcohol.)

Properties.—Carminative, stimulant, emmenagogue, cephalic. *Dose,* 1 to 4 grams (gr. xx–ʒj), in infusion.

SERPYLLUM.—WILD THYME.

Origin. — Thy′mus Serpy′llum, *Linné.* *Natural order,* Labiatæ, Satureineæ.

Habitat.—Northern Asia, Europe; naturalized in North America; cultivated.

Description. — Stem branched, pubescent; leaves short-petioled, about 6 millimeters (¼ inch) long, ovate, obtuse, entire; flowers in small capitate spikes, with a two-lipped calyx, a purplish-spotted, somewhat two-lipped corolla, and four usually short stamens; aromatic and pungent.

Constituents.—Volatile oil, (about 0.5 per cent., spec. grav. 0.91, readily soluble in alcohol), tannin, bitter principle.

Properties.—Carminative, stimulant, tonic, emmenagogue. *Dose,* 1 to 4 grams (gr. gr. xv–ʒj), in infusion.

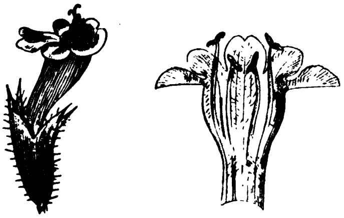
MELISSA.—BALM.

Origin.—Melíssa officinális, *Linné.* *Natural order,* Labiatæ, Satureineæ.

Habitat.—Asia Minor, Southern Europe; naturalized in the United States; cultivated.

Description.—Stem branched, pubescent; leaves petiolate, ovate, about 5 centimeters (2 inches) long, obtuse or somewhat acute, crenate-serrate, the base rounded or rather heart-shaped, somewhat hairy, glandular; branches quadrangular; flowers in about four-flowered cymules, with a tubular bell-shaped five-toothed calyx, a whitish or purplish two-lipped corolla, and four didynamous stamens; fragrant, aromatic, and bitterish.

FIG. 187.



Melissa.—*Flower and corolla magnified.*

Constituents.—Volatile oil ¼ per cent. (spec. grav. 0.89, soluble in alcohol), tannin, bitter principle.

Properties.—Carminative, stimulant, diaphoretic, emmenagogue. *Dose*, 1 to 4 grams (gr. xv–ʒj), in infusion.

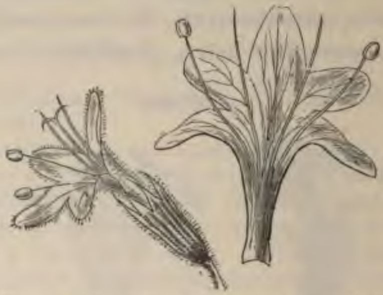
HEDEOMA.—PENNYROYAL.

Origin.—Hedeóma pulegioídes, *Persoon*. *Natural order*, Labiatæ, Satureineæ.

Habitat.—North America, south to Georgia and west to Dakota; in sandy fields.

Description.—Stem subterete, hairy; leaves opposite, short-petioled, about 12 millimeters (½ inch) long, oblong-ovate, obscurely serrate, glandular beneath; flowers in small roundish axillary cymules, with a tubular-ovoid, two-lipped and five-toothed calyx, and a small pale-blue, pubescent, two-lipped corolla, containing two sterile and two fertile exserted stamens; odor strong, mint-like; taste warm and pungent.

Fig. 188.



Flower and corolla of hedeoma, magnified.

Constituents.—Volatile oil, spec. grav. 0.94, readily soluble in alcohol, containing formic, acetic, and isoheptoic ethers, and hedeomol in two modifications (Kremers, 1887).

Properties. — Carminative, stimulant, emmenagogue. *Dose,* 1 to 4 grams (gr. xv–ʒj), in infusion.

MONARDA.—Horsemint.

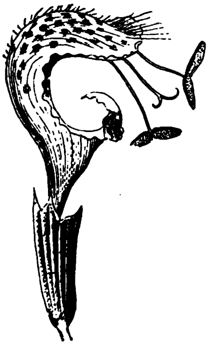
Origin.—Monárda punctáta, *Linné. Natural order,* Labiatæ, Monardeæ.

Habitat.—United States, west to Texas and Colorado; in sandy fields.

Description.—Stem nearly simple; leaves petiolate, lanceolate, about 5 centimeters (2 inches) long, acute, somewhat toothed, glandular, nearly smooth; flowers whorled, with sessile yellow and purple bracts, a tubular, downy, five-toothed calyx, a prominent, two-lipped, pale yellow and purple-spotted corolla, and two stamens; aromatic, pungent, and bitterish.

Constituents.—Volatile oil, yellowish or reddish-brown, neutral, spec. grav. 0.92, readily soluble in alcohol. It contains about 50 per cent. $C_{10}H_{16}$, 24 per cent. thymol, the alcohol $C_{10}H_{18}O$, and its formic, acetic, and butyric ethers.

FIG. 189.



Flower of monarda, magnified.

Properties.—Carminative, stimulant, nervine, emmenagogue. *Dose,* 1 to 4 grams (gr. xv–ʒj), in infusion.

CATARIA.—CATNEP.

Origin.—Népeta Catária, *Linné.* *Natural order,* Labiatæ, Nepeteæ.

Habitat.—Asia, Europe, naturalized in the United States.

Description.—Stem branched, hairy, gray; leaves petiolate, about 5 centimeters (2 inches) long, triangular-ovate, cordate, crenate-serrate, grayish-green, and hairy; flowers in terminal panicles with an obliquely five-toothed calyx, a two-lipped, whitish, purple-spotted corolla, and 4 didynamous stamens; it has a peculiar, somewhat mint-like odor, and a bitterish, aromatic, and pungent taste.

Constituents.—Little volatile oil, tannin (?), bitter principle (crystalline, soluble in ether, acid reaction, not a glucoside), sugar, gum, ash 12.5 per cent.

Properties.—Carminative, stimulant, tonic, diaphoretic, emmenagogue. *Dose*, 1 to 4 grams (gr. xv–ʒj), in infusion.

GLECHOMA.—GROUND-IVY.

Origin.—Népeta Glechóma, *Bentham* (Glechóma hederácea, *Linné*). *Natural order*, Labiatæ, Nepeteæ.

Habitat.—Europe, naturalized in the United States.

Description.—Creeping, short-hairy; leaves petiolate, round-reniform, crenate, nearly smooth; flowers in axillary cymules; corolla blue or purplish, much longer than the calyx; somewhat aromatic and bitter.

Constituents.—Volatile oil, bitter principle, etc.

Properties.—Pectoral, tonic, diuretic. *Dose*, 2 to 4 grams (ʒss–j).

MARRUBIUM.—HOREHOUND.

Origin.—Marrúbium vulgáre, *Linné*. *Natural order*, Labiatæ, Stachydeæ.

Habitat.—Europe, Central Asia; naturalized in North America; cultivated.

Description.—Stem branched, white tomentose; leaves opposite, petiolate, roundish-ovate, about 25 millimeters (1 inch) long, obtuse, coarsely crenate, downy above, white hairy beneath; flowers in dense axillary woolly whorls, with a stiffly ten-toothed calyx, a whitish bilabiate corolla and four included stamens; aromatic and bitter.

Constituents.—Little volatile oil, marrubiin, resin, fat, wax, tannin, sugar, gum, albumin, salts. Marrubiin has a bitter taste, is possibly a glucoside, crystallizes in scales or prisms, is soluble in ether, alcohol, chloroform, and hot water, insoluble in benzin, and not precipitated by tannin or salts of metals.

Properties.—Stimulant, tonic, resolvent, deobstruent, anthelmintic. *Dose*, 1 to 2 grams (gr. xv–xxx), in infusion.

SCUTELLARIA.—Skullcap.

Origin.—Scutellária lateriflóra, *Linné.* *Natural order*, Labiatæ, Stachydeæ.

Habitat.—North America, west to Alabama, New Mexico and Oregon; in damp thickets.

Description.—Stem about 50 centimeters (20 inches) high, smooth, branched; leaves opposite, about 5 centimeters (2 inches) long, petiolate, lance-ovate or ovate-oblong, serrate; flowers in axillary one-sided racemes; corolla pale blue; stamens 4, didynamous; calyx closed in fruit, upper lip helmet-shaped; odor slight; taste bitterish.

The following species having a more decidedly bitter taste are sometimes collected; they are indigenous to North America, and have a nearly simple stem and blue flowers:

Sc. integrifólia, *Linné.* Minutely hairy; leaves short-petioled, lance-oblong or linear-oblong, entire; racemes terminal.

Sc. pilósa, *Michaux.* Hairy; leaves petiolate, rhombic-ovate or oblong-ovate, obtuse, crenate, in distant pairs; racemes terminal.

Sc. galericuláta, *Linné.* Nearly smooth; leaves short-petioled, lance-ovate, slightly cordate, crenately serrate; flowers axillary, single.

Constituents.—Bitter principle (crystalline glucoside, soluble in ether), tannin (?), volatile oil (trace), sugar, ash 14 per cent.

Properties.—Tonic, nervine, antispasmodic. *Dose*, 2 to 4 or 8 grams (ʒss–j–ij), in infusion or fluid extract.

LEONURUS.—Motherwort.

Origin.—Leonúrus Cardíaca, *Linné.* *Natural order*, Labiatæ, Stachydeæ.

Habitat.—Europe and Asia, naturalized in North America; in waste places.

Description.—Erect, roughish; leaves petiolate, the lower ones roundish or heart-shaped, the upper ones oblong wedge-shaped, all palmately acutely seven to three-lobed; flowers in dense axillary cymules; calyx spinously five-toothed; corolla exserted, rose-colored, upper lip bearded, lower lip dotted; stamens 4, didynamous; odor unpleasant; taste bitter.

Constituents.—Volatile oil, bitter principle.

Properties.—Pectoral, tonic, stimulant. *Dose,* 2 to 4 grams (ʒss–j), in infusion.

PLANTAGO.—PLANTAIN.

Origin.—Plantágo lanceoláta and P. májor, *Linné. Natural order*, Plantaginaceæ.

Habitat.—North America, along roadsides and in grassy places; introduced from Europe; the second species also indigenous in the Northwestern States.

Description.—Leaves all radical, petiolate, nerved, somewhat toothed, more or less hairy, lanceolate, or of the second species ovate or elliptic; scape with a dense ovate-oblong or, in the second species, cylindrical spike; corolla whitish, membranous, salver-form, four-lobed; stamens 4, exserted; capsule few seeded; inodorous; somewhat bitter and astringent.

Pl. Rugélii, *Decaisne*, indigenous westward to Texas and Minnesota, closely resembles the broad-leaved plantain, but has a long and narrow spike of flowers.

Constituents.—Bitter principle, resin, wax, pectin, citrates, oxalates, ash 12 per cent.

Properties.—Mild astringent, hemostatic; the seeds demulcent.

MITCHELLA.—SQUAW VINE.

Origin.—Mitchélla répens, *Linné. Natural order*, Rubiaceæ, Anthospermeæ.

Habitat.—North America, west to Mississippi; in dry woods.

Description.—Evergreen, slender, creeping; leaves opposite, petiolate, roundish-ovate, entire, smooth; flowers in pairs; corolla salver-form, four-lobed, white or pink, bearded inside, fragrant; fruit a twin-berry, bright-red, four-seeded; taste somewhat astringent and bitter.

Constituents.—Saponin-like compound, principle precipitated by tannin and picric acid, wax, resin, gum, sugar, albuminoids, ash 5.5 per cent.

Properties.—Tonic, astringent, diuretic. *Dose*, 2 to 4 grams (ʒss–j).

GALIUM.—CLEAVERS.

Origin.—Gálium Aparíne, *Linné.* *Natural order*, Rubiaceæ, Galieæ.

Habitat.—Northern Hemisphere, in thickets.

Description. — Stem weak, climbing, quadrangular, retrorsely prickly; leaves in whorls of 6 or 8, linear-oblanceolate, mucronate, margin and midrib rough; cymes loose and few flowered; corolla small, white, rotate, four-lobed; stamens 4; fruit two-seeded, covered with hooked bristles; inodorous; taste saline, somewhat astringent and bitter.

Gálium triflórum, *Michaux*, has whorls of 6 elliptic-lanceolate and cuspidate leaves, and becomes fragrant from coumarin on drying; it grows in most parts of North America, in woodlands.

Constituents.—Tannin, various salts.

Properties.—Diuretic, refrigerant. *Dose*, 2 to 4 grams (ʒss–j), in infusion.

SABBATIA.—SABBATIA, CENTAURY.

Origin.—Sabbátia anguláris, *Pursh*, and S. paniculáta, *Pursh.* *Natural order*, Gentianeæ, Chironieæ.

Habitat.—United States, in dry fields.

Descriptions.—Stem branched above, winged, quadrangular, about 60 centimeters (2 feet) high, smooth; leaves opposite, about 25 millimeters (1 inch) long, clasping, oblong-ovate, acute, entire, five-nerved, or (Sab. paniculata) linear-oblong, obtuse, and one nerved; corolla mostly rose-colored (S. paniculata whitish), wheel-shaped and five-parted; stamens 5; inodorous, bitter.

Sabbátia Ellióttii, *Steudel*, quinine-flower, has leaves about 12 millimeters (½ inch) long, varying between obovate and linear.

Erythræ'a Centaúrium, *Persoon.* European centaury. Stem 30 centimeters (12 inches) high, leaves oval or ovate-oblong, obtuse, three- to five-nerved; otherwise resembling the preceding.

Constituents.—Bitter principle, erythrocentaurin, $C_{27}H_{24}O_8$

(tasteless crystals, colored red by light; readily soluble in benzol, carbon disulphide, chloroform, alcohol and boiling water, less freely in ether; not precipitated by tannin). The bitter principle of European centaury (Lendrich's erythrocentaurin, 1892) is an amorphous glucoside, readily soluble in alcohol and hot water, less so in ether, precipitated by tannin and other alkaloid reagents, splits into a tasteless fermentable sugar and aromatic oil.

Properties.—Tonic, febrifuge. *Dose,* 1 to 4 grams (gr xv–ʒj), in decoction.

CHIRATA.—CHIRETTA.

Origin.—Swértia Chiráta, *Wallich* (Ophélia Chiráta, *Grisebach,* s. Agathótes Chiráyta, *Don*). *Natural order,* Gentianeæ, Swertieæ.

Habitat.—Mountains of Northern India.

Description.—Root nearly simple, about 75 millimeters (3 inches) long; stem branched, nearly 1 meter (40 inches) long, slightly quadrangular above, with a narrow wood circle and thick pith; leaves opposite, sessile, ovate, entire, five-nerved; flowers numerous, small, with a four-lobed calyx and corolla; the whole plant smooth, pale brown, inodorous, and intensely bitter.

Constituents. — Ophelic acid, $C_{13}H_{20}O_{10}$ (bitter, amorphous, viscid, soluble in water, alcohol, and ether, not precipitated by tannin), chiratin, $C_{26}H_{48}O_{15}$ (bitter, crystalline, yellow, soluble in ether, alcohol and warm water, precipitated by tannin, glucoside); ash of leaves 7–8 per cent., of stem about 4 per cent.

Properties.—Tonic, febrifuge. *Dose,* 1 to 3 grams (gr. xv–xlv), in infusion.

Substitution.—Swértia angustifólia, *Wallich,* s. Ophélia angustifólia, *Don,* has the entire stem quadrangular and somewhat winged, and a less bitter taste; pith thin and often wanting.

CANNABIS INDICA.—Indian Hemp, Gunja.

Origin.—Cánnabis satíva, *Linné.* *Natural order,* Urticaceæ, Cannabineæ.

Habitat.—Asia, collected in India.

Description.—Only the flowering tops of the female plant are collected. About 5 centimeters (2 inches) long, compressed, brittle, branching, with few digitate leaves and lance-linear leaflets, and numerous sheathing and pointed bracts, each containing two small pistillate flowers, sometimes with the nearly ripe fruit, the whole more or less agglutinated with a resinous exudation; it has a brownish-green color, a peculiar narcotic odor, and a slightly acrid taste.

Cánnabis americána.—The hemp plant grown in the Southern United States. Stem 2 or 3 meters (6 to 10 feet) high, rough; leaves alternate above, petiolate, digitate, the leaflets linear-lanceolate, serrate; staminate flowers in loose pedunculate clusters, forming compound racemes; pistillate flowers small, mostly in pairs, axillary, sessile, bracteate and with two slender unequal styles; odor somewhat heavy; taste bitterish, slightly acrid.

Constituents.—Little volatile oil (mainly $C_{10}H_{16}$), brown amorphous resin, about 15 to 20 per cent., cinnabinon (soft resin), choline. Choline (bilineurine), $C_5H_{15}NO_2$, is syrupy, freely soluble in water and alcohol, and yields with Mayer's solution a yellow crystalline precipitate; it is contained in Hay's tetanocannabine, and with alkalies gives trimethylamine (Siebold's cannabinine) (E. Jahns, 1887.) American hemp contains a small proportion of resin.

Properties.—Anodyne, nervine, sudorific. *Dose,* 0.5 to 1 gram (gr. viij–xv), mostly as extract, 0.03 to 0 20 gram (gr. ss–iij).

8. LEAFY TOPS.—CACUMINA, SUMMITATES.

Among the herbs are included the tops of plants which are usually collected with flowers. The present division embraces a few drugs having imbricated leaves, and collected occasionally with the fruit, but never with the flowers. The plants yielding these drugs are trees of the natural order Coniferæ, group Cupressineæ.

Twigs quadrangular, oil-gland near the base of the leaves.	Juniperus virginiana.
the leaves with an oil-gland on the back.	Sabina.
Twigs two-edged, the flat leaves with a gland on the back.	Thuja.

JUNIPERUS VIRGINIANA.—Red Cedar.

Origin.—Juníperus virginiána, *Linné.* *Natural order*, Coniferæ, Cupressineæ.

Habitat.—North America, excepting Western Texas, California, and Oregon.

Description.—The commercial branchlets are about 25 millimeters (1 inch) long, somewhat quadrangular; leaves in four rows, opposite, scale-like, about 2 millimeters ($\frac{1}{12}$ inch) long, appressed, imbricated, lance-ovate or rhomboid, acute, the older ones much longer, sharply acute and spreading, on the back with a longitudinal furrow and near its base a circular or oblong gland; odor terebinthinate; taste balsamic, bitterish, and acrid. Peduncle of the galbulus (berry) erect.

Constituents.—Volatile oil (not readily soluble in alcohol), resin, tannin, etc. The volatile oil distilled from the wood consists mainly of cedrene, $C_{15}H_{24}$, with some camphor, $C_{15}H_{26}O$.

Properties.—Diuretic, emmenagogue, vermifuge, less irritant than savine. *Dose*, 0.2 to 0.5 or 1 gram (gr. iij–viij–xv), in powder or infusion.

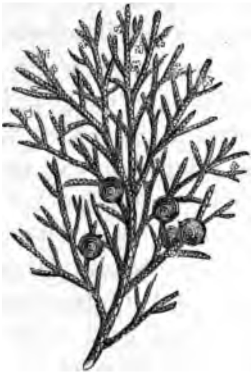
SABINA.—SAVINE.

Origin.—Junı́perus Sabı́na, *Linné. Natural order*, Coniferæ, Cupressineæ.

Habitat. — Siberia, Europe, Canada, and Northern United States.

Description.—Short, thin, subquadrangular branchlets; leaves in four rows, opposite, scale-like, about 2 millimeters ($\frac{1}{12}$ inch) long, appressed, imbricated, rhombic-lanceolate, the older ones longer, sharply acute and spreading, on the back with a shallow groove containing an oblong or roundish gland; odor terebinthinate; taste nauseous, resinous, and bitter. Galbulus (berry) if present, upon a recurved peduncle.

FIG. 190.



Sabina.

Constituents.—Volatile oil, chiefly $C_{10}H_{16}$, about 2 per cent., resin, tannin. The volatile oil, $C_{10}H_{16}$, is of spec.

grav. 0.91, not readily soluble in alcohol, and boils near 160° C. (320° F.), the boiling-point rising to over 200° C.

Properties.— Irritant, diuretic, hæmagogue, emmenagogue, vermifuge. *Dose*, 0.2 to 0.5 or 1 gram (gr. iij–viij–xv), in powder, infusion, or fluid extract.

THUJA.—ARBOR VITÆ.

Origin.—Thúja occidentális, *Linné. Natural order*, Coniferæ, Cupressineæ.

Habitat.—Canada and United States south to North Carolina and west to Minnesota; also cultivated for ornament.

Description.—Twigs flattish, two-edged, pale green on the lower side, the scale-like leaves appressed in four rows, rhombic-ovate, obtusely pointed, the flat ones about 5 millimeters ($\frac{1}{5}$ inch) long, closely imbricate, and with a roundish gland near the apex; the others folded lengthwise, boat-shaped, about 4 millimeters ($\frac{1}{6}$ inch) long, and mostly glandless; odor balsamic, somewhat terebinthinate; taste pungently aromatic, camphoraceous, and bitter.

Chamæcy′paris sphæroídea, *Spach* (Cupréssus thyoídes, *Linné*); like the preceding plant, often called white cedar, grows southward to Florida and Mississippi. The twigs resemble those of thuja, but are more slender, less flattened; the leaves are 1.5 to 2 millimeters ($\frac{1}{16}$–$\frac{1}{12}$ inch) long, and the flat leaves have a longitudinal groove on the back.

Constituents.—Volatile oil about 1 per cent. (readily soluble in alcohol, contains O), resin, tannin, pinipicrin, $C_{22}H_{18}O_{11}$ (yellow, bitter, soluble in water and alcohol, insoluble in ether; glucoside, yields ericinol), thujin, $C_{20}H_{22}O_{12}$ (yellow, crystalline, astringent, dark green with ferric salts; soluble in alcohol and water, glucoside, precipitated by lead acetate), thujigenin, $C_{14}H_{12}O_7$ (precipitated by basic lead acetate, the alcohol solution green with NH_3).

Properties.—Stimulant, diuretic, irritant. *Dose*, 1 to 4 grams (gr. xv–ʒj), in infusion and fluid extract.

9. FLOWERS AND PETALS.—FLORES ET PETALA.

Flowers contain the male or female, or both kinds, organs of reproduction, surrounded by two circles of modified leaves, of which those of the inner circle, the petals forming the corolla, very generally have a color differing from green, while those of the outer circle, the sepals forming the calyx, mostly have a green color. The modified leaves of these two whorls are sometimes of the same shape and color, or one of the whorls is entirely wanting; in both these cases they, whether green or of a different color, are called perianth or perigone. The flowers of some plants are placed close together upon a common receptacle, and such a head is surrounded by one or more whorls of modified, frequently scale-like leaves called the involucre, a term which is also employed to designate the whorl of modified leaves found outside of the calyx of each flower in certain plants. The male organs of reproduction, or stamens, consist each of a filament which is usually thin and filiform, and bears at its apex the mostly two-celled anther; in the cells of the latter the pollen is contained. The female organ of reproduction consists of one or more ovules inclosed by one or more carpels (modified leaves) forming the ovary, and frequently prolonged above into a style bearing the stigma. In the absence of the style, the stigma is attached to the ovary, and is said to be sessile.

The shortened axis upon which the organs of reproduction are attached is the torus, also called the receptacle. The footstalk of a flower is called the peduncle, and its branches, the pedicels.

Classification.

I. Buds, unexpanded flowers.	
Calyx superior, four-cleft.	Caryophyllus.
Small heads with an imbricated involucre.	Santonica.
II. Expanded flowers and petals.	
1. Petals distinct; corolla polypetalous.	
Calyx inferior, corolla white, ovary one.	Aurantium.
Inflorescence cymose; the peduncle partly united with a leafy bract.	Tilia.
Inflorescence paniculate; sepals 5, reddish; petals small.	Brayera.
Petals numerous, clawed, rose-colored.	Rosa centifolia.
deep red.	Rosa gallica.
Petals short-clawed, dull purple, with a black spot.	Rhœas.
Petal with the claws attached to the column of filaments; involucre six-cleft.	Althæa rosea.
involucre three-leaved.	Malva.
2. Petals united; corolla gamopetalous.	
Flowers compound, rays white; receptacle conical, hollow; pappus none	Matricaria.
rays white, in many rows; receptacle conical, not hollow; pappus a short crown.	Anthemis.
rays whitish or rose-colored. receptacle convex; pappus a short crown.	Pyrethri flores.
rays yellow; pappus bristly.	Arnica.
akenes curved, pappus none.	Calendula.
Florets tubular, five-lobed, brownish red.	Carthamus.
Flowers not compound; corolla whitish, wheel-shaped, five-lobed.	Sambucus.
corolla wheel-shaped, five-lobed, yellow.	Verbascum.
corolla blue, two-lipped; calyx blue-gray, five-toothed.	Lavandula.

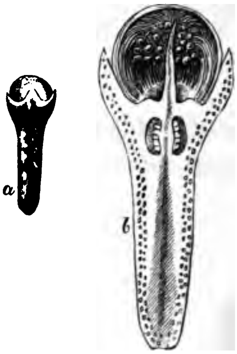
CARYOPHYLLUS.—CLOVES.

Origin.—Eugénia caryophylláta, *Thunberg* (Caryophy'llus aromáticus, *Linné*). *Natural order*, Myrtaceæ, Myrteæ.

Habitat.—Molucca Islands; cultivated in tropical countries.

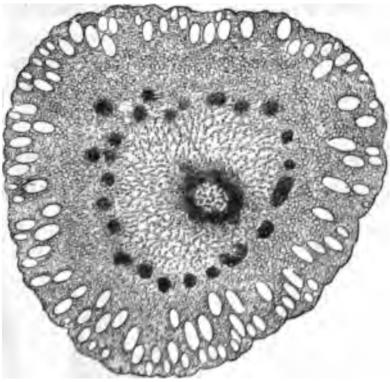
Description.—About 15 millimeters ($\frac{3}{5}$ inch) long, dark brown, consisting of a subcylindrical, solid, and glandular calyx-tube, 3 or 4 millimeters ($\frac{1}{8}$ or $\frac{1}{6}$ inch) thick, and containing near its apex the two-celled, several-ovuled ovary, and terminated by four obtuse teeth; it is surmounted by a globular head, formed by four glandular petals, which cover numerous curved stamens and one style, the latter situated in the centre, and the former near the base of an elevated disk. Cloves contain numerous oil-glands under the epidermis, emit oil when scratched, and have a strong aromatic odor and a pungent, spicy taste.

FIG. 191.



Caryophyllus.—*a*. Natural size. *b* Longitudinal section magnified.

FIG. 192.



Clove.—Transverse section, magnified 15 diameters.

Constituents.—Volatile oil 18 per cent., tannin 13 per cent., gum 13 per cent., resin 6 per cent. (tasteless), wax, caryophyllin, $C_{10}H_{16}O$ (white, tasteless needles, blood-red with sulphuric acid), eugenin, $C_{10}H_{12}O_2$ (pearly scales from distillate, colored red by nitric acid). The volatile oil is readily soluble in alcohol, and consists of a sesquiterpene, $C_{15}H_{24}$, spec. grav. 0.91, and eugenol or eugenic acid, $C_{10}H_{12}O_2$, a colorless oil, spec. grav. 1.076, the solution blue with ferric chloride, by permanganate oxidized to vanillic acid.

Properties.—Stimulant, stomachic, antiemetic. *Dose*, 0.2 to 0.5 gram (gr. iij–viij), in powder; mostly used as a condiment.

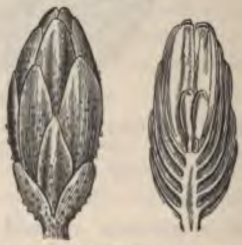
SANTONICA.—SANTONICA, LEVANT WORMSEED.

Origin.—Artemísia marítima, *Linné*, *var.* Stechmanniána, *Besser*. *Natural order*, Compositæ, Anthemideæ.

Habitat.—Turkestan.

Description.—Unexpanded flower-heads, oblong-ovoid, about 2 or 3 millimeters ($\frac{1}{12}$–$\frac{1}{8}$ inch) long, obtuse, smooth, somewhat glossy, grayish-green, after exposure to light brownish-green, with an involucre of about 18 imbricated ovate or oblong glandular scales, inclosing 4 or 5 rudimen-

Fig. 193.



Santonica.—Head and longitudinal section, magnified 10 diam.

tary florets; odor strong, peculiar, somewhat camphoraceous; taste aromatic and bitter.

Constituents.—Volatile oil 2 per cent. (consists mainly of cineol, $C_{10}H_{18}O$, agitated with iodine solution yields greenish crystals of $C_{10}H_{18}OI_2$), santonin 1½–2 per cent., resin, gum, etc. Santonin, $C_{15}H_{18}O_3$, is white crystalline, soluble in chloroform, alcohol, and ether, sparingly soluble in water, colored yellow in sunlight, and forms with alkalies bitter soluble compounds. Cold nitric acid dissolves it without color; the colorless solution in sulphuric acid gradually turns red, and with ferric chloride becomes violet-colored. Santonin has been adulterated with boric acid, salicin, and strychnine.

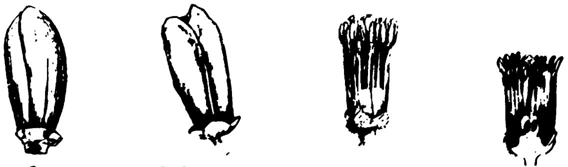
Properties.—Stimulant, anthelmintic. *Dose*, 1 to 4 grams (gr. xv–ʒj), in powder, or electuary; santonin, 0.016 to 0.06 gram (gr. ¼–j), in powder or troches.

AURANTII FLORES.—ORANGE FLOWERS.

Origin.—Cítrus vulgáris and Cítrus Aurántium, *Risso*. *Natural order*, Rutaceæ, Aurantieæ.

Habitat.—Northern India; cultivated in subtropical countries.

FIG. 194.



Orange flowers, natural size; unexpanded, petals removed, and section.

Description.—The partly expanded flowers are collected and mostly used in the fresh state. About 15 millimeters (⅗ inch) long; calyx small, cup-shaped, five-toothed; petals 5, oblong, obtuse, rather fleshy, white, and glandular punctate; stamens numerous with the filaments united near the base, in about three sets; ovary globular, about ten-celled, situated upon a small disk, with a cylindrical style and globular stigma; odor very fragrant; taste aromatic, somewhat bitter. Dried flowers are brownish.

When it is desirable to keep fresh orange flowers for some time, they may be preserved by being well mixed with half their weight of chloride of sodium.

Constituents.—Volatile oil (spec. grav. 0.89, fluorescent with alcohol), mucilage, bitter extractive.

Properties.—Stimulant, antispasmodic; used for preparing orange-flower water.

TILIA.—LINDEN FLOWERS.

Origin.—Tília americána, *Linné*, and T. heterophy′lla, *Ventenat*. *Natural order*, Tiliaceæ, Tilieæ.

Habitat.—North America, west to Manitoba and Texas.

Description.—Cymes varying between about seven- and thirty-flowered, the long peduncle partly united to an oblong-lanceolate bract, which is about 75 millimeters (3 inches) long, and 10 millimeters (⅖ inch) wide; calyx five-parted; petals 5, yellowish, notched at the base with a large scale; stamens numerous, hypogynous, in 5 groups united with the petaloid scales; ovary five-celled; stigma five-lobed; odor agreeable, taste sweet, mucilaginous.

Tília ulmifólia, *Scopoli*, indigenous to Europe, cultivated in the United States, has about seven-flowered cymes and the petals without scales. The cymes of T. platyphy′lla, *Scopoli*, are mostly three-flowered.

Constituents.—Volatile oil, mucilage, sugar, tannin.

Properties.—Diaphoretic, stimulant, lenitive. *Dose*, 1 to 2 grams (gr. xv–xxx).

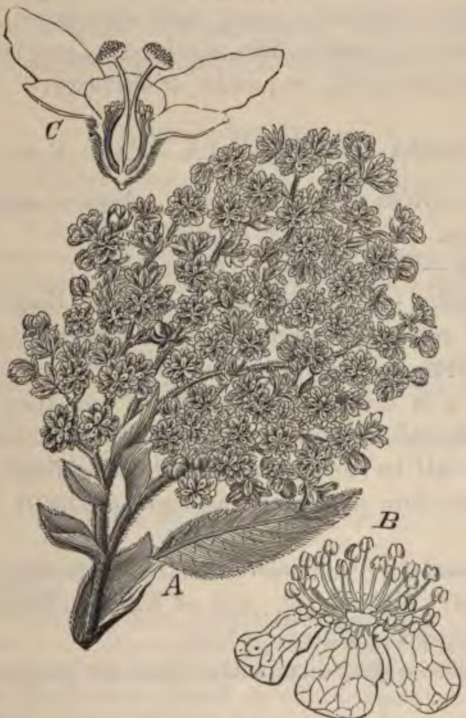
BRAYERA.—KOOSSO.

Origin.—Brayéra anthelmíntica, *Kunth* (Hagénia abyssínica, *Willdenow*). *Natural order*, Rosaceæ, Poterieæ.

Habitat.—Abyssinia.

Description.—The female inflorescence is collected. In rolls, or compressed bundles, consisting of hairy and glandular panicles about 25 centimeters (10 inches) long, with a sheathing bract at the base of each branch; the two roundish bracts at the base of each flower and the five obovate outer sepals are of a reddish color, membranous, and veiny; flowers about 6 millimeters ($\frac{1}{4}$ inch) broad; calyx top-shaped, hairy, inclosing one or two ovate-

Fig. 195.



Brayera anthelmintica, *Kunth.*—*A.* Branch of panicle. *B.* Staminate flower, and *C.* pistillate flower, magnified 4 diam.

oblong and pointed carpels or nutlets; odor slight tea-like; taste bitter and nauseous.

Constituents.—Tannin 24 per cent., bitter acrid resin 6¼ per cent., tasteless resin, little volatile oil, ash about 5 per cent. Kosin or Koussin is yellow, crystalline, tasteless, fusible; soluble in chloroform, benzol, ether, and alcohol; the alcoholic solution reddened by ferric chloride; insoluble in water; said to be nearly inert when pure.

Properties.—Anthelmintic, tænifuge. *Dose*, 16 to 24 or 32 grams (ʒiv–vj–℥j), in powder or electuary.

ROSA CENTIFOLIA.—Pale Rose.

Origin.—Rósa centifólia, *Linné.* *Natural order*, Rosaceæ, Roseæ.

Habitat.—Western Asia; cultivated.

Description.—The petals are collected. Roundish-obovate and retuse, or obcordate, pink, fragrant, sweetish, slightly bitter, and faintly astringent.

When it is desirable to keep fresh pale rose for some time, it should be preserved by being intimately mixed with one-half its weight of chloride of sodium, pressing the mixture into a suitable jar, and keeping it in a cool place.

Constituents.—Little volatile oil, mucilage, sugar, tannin (quercitrin?), malates, etc. Oil of rose is obtained from Rósa damascéna, *Miller.*

Properties.—Mild carminative; used for preparing rose-water.

ROSA GALLICA.—Red Rose.

Origin.—Rósa gállica, *Linné.* *Natural order*, Rosaceæ, Roseæ.

Habitat.—Asia Minor and Southern Europe; cultivated.

Description.—The petals are collected before the flowers are expanded. Small cones, consisting of numerous imbricated, roundish, retuse, deep purple-colored, yellow-clawed petals, having a roseate odor and a bitterish, slightly acidulous, and distinct astringent taste.

Constituents.—Volatile oil a trace, mucilage, sugar, quercitrin.

Properties.—Tonic, mild astringent. *Dose,* 1 to 4 grams (gr. xv–ʒj), in powder, confection, or infusion.

RHŒAS.—RED POPPY.

Origin.—Papáver Rhœ'as, *Linné.* *Natural order,* Papaveraceæ, Papavereæ.

Habitat.—Asia and Europe, in fields.

Description.—Petals roundish, about 5 centimeters (2 inches) broad, somewhat shorter, below contracted into a short blackish claw, thin, brownish-purple (fresh scarlet-red); odor slight; taste mucilaginous and bitterish.

Constituents.—Rhœadine a trace, probably a second alkaloid, rhœadic and papaveric acids (red coloring matters), gum, etc.

Properties.—Demulcent, mildly anodyne, used chiefly for coloring mixtures.

ALTHÆA ROSEA.—HOLLYHOCK.

Origin.—Althæ'a (Alcéa, *Linné*) rósea, *Cavanilles.* *Natural order,* Malvaceæ, Malveæ.

Habitat.—Western Asia, cultivated in gardens.

Description.—Involucre six-cleft, shorter than the five-cleft calyx, the lobes lance-ovate, stellately hairy; corolla 7 to 10 centimeters (3–4 inches) broad, in cultivation often double, the five petals broadly obovate, retuse or notched at the apex, the claws attached to the base of the column formed by the united numerous filaments; the color varies from white to deep red and purple, and becomes deeper on drying; odor slight; taste sweetish, mucilaginous, somewhat astringent.

Constituents.—Mucilage, tannin, coloring matter.

Properties.—Demulcent, emollient.

MALVA.—MALLOW.

Origin.—Málva sylvéstris, *Linné.* *Natural order,* Malvaceæ, Malveæ.

Habitat.—Europe, introduced in North America.

Description.—Involucre three-leaved, hairy; calyx about 5 millimeters ($\frac{1}{5}$ inch) long, five-cleft, hairy; petals five, 2 centimeters ($\frac{4}{5}$ inch) long, obcordate, the claws attached to the base of the column formed by the united numerous filaments; the color is rose-red or purplish with darker veins, after drying blue; odor slight, taste mucilaginous, sweetish.

Constituents.—Mucilage, coloring matter, reddened by acids and turned green by ammonia.

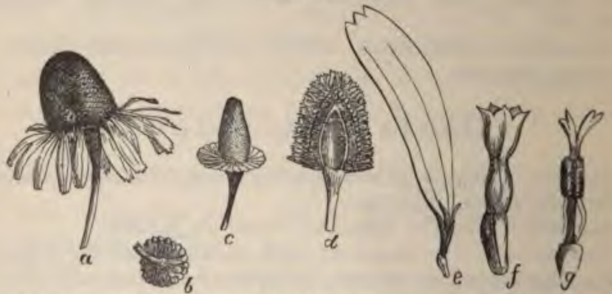
Properties.—Demulcent, emollient.

MATRICARIA.—GERMAN CHAMOMILE.

Origin.—Matricária Chamomílla, *Linné.* *Natural order,* Compositæ, Anthemideæ.

Habitat.—Europe and Western Asia.

FIG. 196.



Matricaria.—*a.* Flower-head. *b.* Involucre. *c.* Receptacle and involucre. *d.* Longitudinal section of receptacle, with disk florets. *e.* Ray floret. *f.* Disk floret. *g.* Stamens and style of disk floret.

Description.—Flower-heads about 10 millimeters ($\frac{2}{5}$ inch) broad; involucre flattish, imbricated, the scales oblong, obtuse, and with a scarious margin; receptacle conical, pitted, hollow, naked; ray florets about 15, white, ligulate, three-toothed, pistillate, reflexed, about 8 millimeters (⅓ inch) long; disk florets numerous, yellow, tubular, perfect, about 3 millimeters (⅛ inch) long; akenes oblong, without pappus; strongly aromatic and bitter.

The similar flower-heads of A′nthemis arvénsis, *Linné*, and Marúta Cótula, *De Candolle*, have a conical chaffy receptacle.

Constituents.—Volatile oil ¼ per cent. (dark blue, soluble in alcohol), anthemic acid (bitter needles), anthemidin (tasteless), extractive, little tannin, malates, etc.

Properties.—Stimulant, mild tonic, carminative, nervine, emmenagogue. *Dose*, 1 to 4 grams (gr. xv–ʒj), in infusion.

ANTHEMIS.—CHAMOMILE.

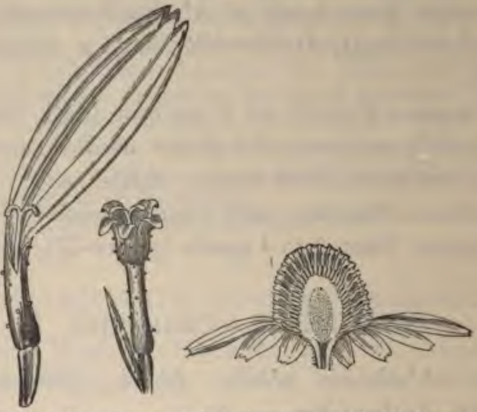
Origin—A′nthemis nóbilis, *Linné*. *Natural order*, Compositæ, Anthemideæ.

Habitat.—Southern and Western Europe; cultivated; naturalized in a few localities in the United States.

Description.—Collected from cultivated plants. The wild-grown flower-heads have about 15 ray florets in one row; the cultivated plants have the tubular disk florets mostly transformed into ligulate florets. Subglobular, about 2 centimeters (⅘ inch) broad; involucre hemispherical, imbricated, the scales ovate-oblong and with a scarious margin; receptacle solid, conical, densely chaffy; ray florets numerous, white, pistillate, strap-shaped, three-toothed; disk florets few, yellow, tubular; akenes obovate with a short crown. Odor strong and pleasant; taste aromatic, bitter.

Constituents.—Anthemene, $C_{18}H_{36}$ (tasteless needles, melt at 63° C.), volatile oil (nearly 1 per cent., blue, green, or yellow, spec. grav. 0.90, soluble in alcohol, contains anthemol, $C_{10}H_{16}O$, and the isobutylic and isamylic esters of isobutyric and angelic acids), bitter principle (anthemic acid?), resin, little tannin, etc.

FIG. 197.



Anthemis nobilis.—Ray and disk floret, magnified 4 diam. Section through single flower-head.

Properties.—Stimulant, tonic, carminative, nervine, emmenagogue. *Dose,* 1 to 4 grams (gr. xv–ʒj), in infusion or fluid extract.

PYRETHRI FLORES.—Insect Flowers.

Origin.—1. Chrysánthemum (Pyréthrum, *Treviranus*) cinerariæfólium, *Visiani;* 2. Chrys. (Pyréthrum, *Bieberstein*) róseum and C. cárneum, *Weber.* *Natural order,* Compositæ, Anthemideæ.

Habitat.—1. Dalmatia. 2. Western Asia.

Description.—Flower-heads depressed roundish, about 25 millimeters (1 inch) broad; involucre hemispherical, imbricate, the scales obtuse, brownish with a whitish scarious margin (No. 1), or greenish and with a red-brown scarious margin (No. 2); receptacle somewhat convex, naked; ray florets about 20, whitish (No. 1) or rose colored (No. 2), ligulate, three-toothed, pistillate; disk florets yellow, tubular, five-toothed, perfect; akenes obovate with a short scarious, somewhat toothed crown; odor peculiar, aromatic; taste bitter and acrid.

Constituents.—Volatile oil, a volatile acid, wax, non-volatile balsamic acid, resin acid, chrysanthemine (liquid), glucoside (crystalline), sugar, a hydrocarbon, and a higher homologue of cholesterin.

Properties.—Insecticide; externally as powder or tincture. The Dalmatian insect flowers collected shortly after expansion are considered the most effectual.

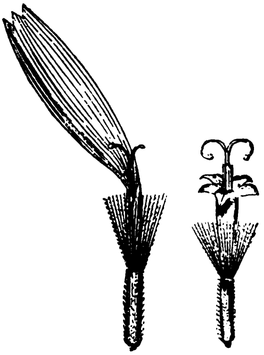
ARNICA.—Arnica Flowers.

Origin.—A'rnica montána, *Linné*. *Natural order*, Compositæ, Senecionideæ.

Habitat.—Europe, and Northern Asia, in mountainous districts.

Description.—Flower-heads depressed roundish, about 25 millimeters (1 inch) broad; involucral scales lanceolate, acute, hairy, in two rows; receptacle nearly flat, pitted, and hairy; ray florets 15 to 20, yellow, strap-shaped, 2 or 3 centimeters ($\frac{4}{5}$–$1\frac{1}{4}$ inches) long, eight- or ten-nerved, three-toothed, pistillate; disk florets numerous, yellow, about 15 millimeters ($\frac{3}{5}$ inch) long, five-toothed tubular,

Fig. 198.



Arnica montana.—Ray and disk florets.

perfect; akenes slender, spindle-shaped, rough, crowned with a hairy pappus, 6 or 8 millimeters (¼–⅓ inch) long; feebly aromatic; acrid and bitter; the dust sternutatory.

Some pharmacopœias direct the removal of the involucre with the receptacle, which frequently contains the larvæ of an insect (Trypeta).

A′rnica foliósa, *Nuttall*, A. alpína, *Olin*, and A. Chamissónis, *Lessing*, have flowers resembling the preceding; the plants are indigenous to the mountains of Colorado, westward and northward, the last species also eastward to Maine.

Constituents.—Volatile oil (a trace, butyraceous), resin, arnicin (amorphous, yellow, acrid, easily soluble in alcohol and ether).

Properties.—Stimulant, diuretic, vulnerary, irritant. *Dose*, 0.3 to 1 gram (gr. v–xv), in infusion; mostly used externally as tincture.

CALENDULA.—Marigold.

Origin.—Caléndula officinális, *Linné.* *Natural order*, Compositæ, Calendulaceæ.

Habitat.—Levant and Southern Europe; cultivated.

Description.—Flower-heads about 5 centimeters (2 inches) broad, with the involucral scales in two rows, lanceolate, acute, hairy, and equal; a flat and naked receptacle, and incurved, muricate akenes without pappus; the yellow disk florets tubular, five-toothed, and staminate.

The ray florets, which are usually employed instead of the flower-heads, are in one or occasionally in several rows, pistillate, ligulate, 10 to 20 millimeters (⅖ to ⅘ inch) long, about 3 millimeters (⅛ inch) broad, the limb delicately veined in a longitudinal direction, three-toothed at the apex; the short hairy tube enclosing the remnants of the filiform style which terminates in two elongated branches; odor slightly narcotic; taste somewhat bitter, slightly saline.

Constituents.—Amorphous bitter principle, tasteless yellow calendulin, sugar, gum, etc.

Substitutions.—The flower-heads of Tagétes erécta and Tag. pátula, *Linné*, cultivated as French or African marigold, have a tubular involucre, yellow or variegated broad ray florets, and straight slender flattish akenes with a chaffy pappus.

Properties.—Stimulant, resolvent, vulnerary. *Dose*, 0.5 to 1 gram (gr. viij–xv), in infusion, tincture, or extract.

CARTHAMUS.—SAFFLOWER.

Origin.— Cárthamus tinctórius, *Linné.* *Natural order*, Compositæ, Cynaroideæ.

Habitat.—India; cultivated.

Description.—The tubular florets are collected. Cylindrical, about 2 centimeters (⅘ inch) long, five-lobed; lobes nearly linear; tube of the anthers protruding from the throat, and surmounted by the two-cleft style; brownish-red; odor slight; taste insipid, bitterish.

Constituents. — Carthamin, $C_{14}H_{16}O_7$, about 0.5 per cent. (red-brown, with metallic lustre, soluble in alcohol and alkalies, sparingly so in water, insoluble in ether), yellow coloring matter about 20 per cent. (soluble in water and alcohol), mucilage, etc.

Properties.—Diaphoretic, tonic, laxative. *Dose*, 0.5 to 1 gram (gr. viij–xv), in infusion.

SAMBUCUS.—ELDER.

Origin.—Sambúcus canadénsis, *Linné.* *Natural order*, Caprifoliaceæ, Sambuceæ.

Habitat.—North America, west to the Rocky Mountains; in damp places.

Description.—In large corymbose five-rayed cymes; calyx half-superior, minutely five-toothed; ovary three-celled, three-ovuled, and with 3 sessile stigmas; corolla cream-colored, after drying yellowish, wheel-shaped, five-lobed, and on the short tube with five stamens; of a peculiar fragrance and mucilaginous, slightly bitter taste.

Elder should be collected in dry weather, rapidly dried, and deprived of the stalks.

The inflorescence and flowers of Sambúcus nígra, *Linné*, the European elder, closely resemble the preceding.

Constituents.—Volatile oil (butyraceous), little fat, wax, and resin; mucilage, sugar; probably a little tannin; pectin and albuminoids.

Properties.—Stimulant, carminative, diaphoretic. *Dose*, 2 to 4 grams (ʒss–j), in infusion.

VERBASCUM.—MULLEIN.

Origin.—1. Verbáscum phlomoídes, *Linné*. 2. V. thapsifórme, *Schrader*. 3. V. Thápsus, *Linné*. *Natural order*, Scrophulariaceæ, Verbasceæ.

Habitat.—Europe, in fields; No. 3 naturalized in North America.

Description.—The five-lobed calyx is often rejected. Corolla wheel-shaped, 2 to 4 centimeters (⅘ to 1½ inches) broad; lobes five, roundish-obovate, bright yellow, smooth above, stellately hairy beneath; stamens in the short tube five, three filaments white-woolly and two naked; the corolla of No. 3 about 10 millimeters (⅖ inch) broad; odor slight, honey-like; taste mucilaginous and sweet.

Constituents.—Volatile oil a trace, mucilage, sugar, etc.

Properties.—Demulcent, pectoral. *Dose*, 1 to 4 grams (gr. xv–ʒj).

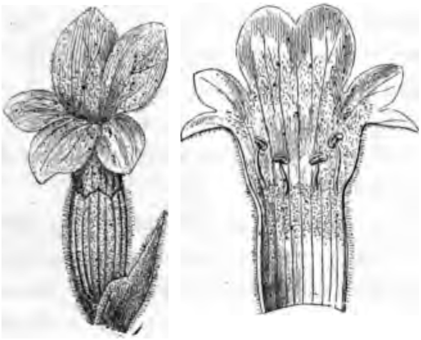
LAVANDULA.—LAVENDER.

Origin.—Lavándula véra, *De Candolle*. *Natural order*, Labiatæ, Ocimoideæ.

Habitat.—Southern Europe; cultivated.

Description.—Bracts rhombic-ovate, pointed, brownish, and glandular; calyx tubular, about 5 millimeters ($\frac{1}{5}$ inch) long, blue-gray, hairy and glandular, five-toothed, the upper tooth largest and roundish-rhomboid; corolla violet-blue, about 10 millimeters ($\frac{2}{5}$ inch) long, hairy and glandular on the outside, tubular, and two-lipped, the upper lip two-lobed, the smaller lower lip three-lobed; stamens four, didynamous, short, on the corolla-tube; odor fragrant; taste bitterish aromatic, somewhat camphoraceous.

FIG. 199.



Lavender flower and corolla, magnified 4 diam.

Constituents.—Volatile oil $1\frac{1}{2}$ to 3 per cent., resin, little tannin. The volatile oil contains $C_{10}H_{16}$, and the alcohol $C_{10}H_{18}O$ (linalool), and its acetic ester; spec. grav. 0.90; readily soluble in alcohol, and very fragrant; distilled from the leaves and stalks the odor is more rank.

Properties.—Stimulant, carminative, nervine, errhine. *Dose*, 1 to 2 grams (gr. xv–xxx), in infusion, but rarely used internally.

10. FRUITS.—FRUCTUS.

The fruit is the ripened ovary of a flower, and consists of the pericarp or fruit-integuments inclosing one or more seeds. The outer layer of the pericarp is called epicarp or exocarp, the inner layer endocarp. A middle layer, the mesocarp or sarcocarp, is present in many, particularly the fleshy, fruits. Fruits are crowned with the style or its remnants, or are marked with a scar where the style had been attached; a second scar is found at the base of the fruit, where it had been connected with the foot-stalk or attached to the floral axis.

With few exceptions, the officinal fruits consist of fructified single pistils; the exceptions are two aggregate fruits (staranise and raspberry), composed of several separate carpels belonging to one flower; one anthocarpous fruit (rose hip), composed of a fleshy receptacle inclosing several akenes; and a few collective fruits, produced by the aggregation of several or many flowers.

Classification.

Sect. 1. Collective fruits.

Berry-like, containing three seeds with oil-glands.	Juniperus.
Cylindrical spikes of numerous coalesced berry-like fruits; peppery.	Piper longum.
Oblong-conical spikes; fleshy, sweet, and acidulous.	Morus.
Glandular strobiles with akenes at the base of the leafy bracts.	Humulus.
Pear-shaped fleshy receptacle with numerous akenes upon the inner surface.	Ficus.

Sect. 2. Fruits of single flowers.

I. Pitcher-shaped fleshy receptacle containing akenes.	Rosa canina.

II. Small drupes and berries, about the size of pepper; superior.	
Ten-celled, ten-seeded, with a dark purple juice.	Phytolacca.
Four-celled, four-seeded, with a convex inferior disk.	Rhamnus cathartica.
One-celled, one-seeded, bright red, woolly.	Rhus glabra.
black, globular, pericarp prolonged into a stalk.	Cubeba.
unstalked, the undeveloped embryo in a central cavity.	Piper nigrum.
whitish, globular, veined, not hollow.	Piper album.
III. Inferior drupaceous fruits.	
Globular, brown, two-celled, two-seeded.	Pimenta.
Oval-oblong, dark brown, two-celled, each cell with one or two seeds.	Caryophylli fructus.
IV. Superior drupes.	
Roundish-reniform, blackish, seed semilunar, bitter.	Cocculus.
Flattish-reniform, brown, nut-like, sarcocarp caustic.	Anacardium occidentale.
Flattish-ovate, blackish, nut-like, sarcocarp caustic.	Anacardium orientale.
Somewhat five-angled, orange- or blackish-brown, very astringent.	Myrobalanus.
Oblong, dark blue, glaucous, sweet.	Prunum.
Hemispherical, red, finely hairy, composed of many small drupes.	Rubus idæus.
V. Superior berries.	
Globular, acidulous, sweet, few-seeded.	Uva passa.
six-celled, six-seeded, very astringent.	Diospyros.
ten-celled, many-seeded, very aromatic.	Aurantium.
twelve-celled, many-seeded, pulp hard, mucilaginous.	Bela.
Oval, with a nipple-shaped apex; pulp very acid.	Limon.
Oblong, two-celled, many-seeded, burningly acrid.	Capsicum.
VI. Inferior berries.	
Pulp white, spongy, separable into three many-seeded cells.	Colocynth.
VII. Capsular fruits, superior.	
Cylindrical, with numerous transverse partitions containing a sweet pulp; indehiscent.	Cassia fistula.

Broadly linear; internally fleshy, sweet.	Ceratonia.
Subglobose; stigmas sessile, radiating; seeds numerous, parietal.	Papaver.
Small utricle; seed lenticular, black, glossy.	Chenopodium.
Capsules 3, two-valved; seeds 1 or 2, black.	Xanthoxylum.
Follicles 8, stellate, one-seeded, aromatic.	Illicium.
VIII. Capsular fruits, inferior.	
Triangular-ovate, three-celled; pericarp dry, tasteless; seeds spicy.	Cardamomum.
Long-linear, subtriangular, fleshy, one-celled, many-seeded, aromatic.	Vanilla.
IX. Akenes.	
Grayish-yellow, grooved; pericarp and testa coalesced.	Hordei fructus.
Brown-gray and black, roughish, somewhat curved.	Lappæ fructus.
glossy, straight; the oblique apex margined.	Silybum.
Greenish-gray, veined, glossy.	Cannabis.
X. Cremocarps; fruits of umbelliferæ.	
Cœlospermous, globular, 2 vittæ in each mericarp.	Coriandrum.
Campylospermous, ovate, laterally compressed, vittæ none.	Conium.
Orthospermous, ovate, laterally compressed, hairy, each mericarp about 15 vittæ.	Anisum.
ovate, laterally compressed, smooth, each mericarp 12 vittæ.	Apium.
smooth, each mericarp 6 vittæ.	Petroselinum.
rough, each mericarp 6 vittæ.	Ajowan.
oblongterete, smooth, each mericarp 6 vittæ, ribs obtuse, prominent.	Fœniculum.
ribs obtuse, thin.	Phellandrium.
oblong, laterally compressed, each mericarp 6 vittæ, ribs 9, rough.	Cuminum.
ribs 5, smooth.	Carum.
oblong, dorsally compressed, each mericarp 6 vittæ, ribs 5, smooth.	Anethum.
ribs 9, bristly.	Carota.
XI. Parts of fruits.	
Pericarp leathery, glandular, orange-colored.	Aurantii cortex.
yellow.	Limonis cortex.

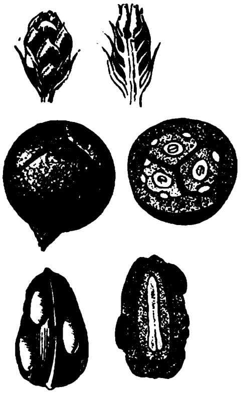
very hard, with adhering mucilaginous pulp.	Bela (see Fruits).
brittle, brown, crowned with calyx.	Granati fructus cortex.
Pulp acidulous, red-brown, with flat, subquadrangular, glossy seeds.	Tamarindus.

JUNIPERUS.—JUNIPER.

Origin.—Juníperus commúnis, *Linné.* *Natural order,* Coniferæ, Cupressineæ.

Habitat. — Northern hemisphere; in North America throughout Canada, the Northern United States, and in the Rocky Mountains south to New Mexico.

FIG. 200.



Juniperus.—Fertile catkin and longitudinal section. Galbulus, and transverse section. Seed, and longitudinal section.

Description.—Nearly globular, about 8 millimeters ($\frac{1}{3}$ inch) in diameter; dark purplish, with a bluish-gray bloom, at the apex with a three-rayed furrow, and at the base usually with one or two whorls of three small brownish scales; internally pulpy, greenish-brown, with oil cells, and containing three ovate somewhat triangular bony seeds with several large oil glands on the surface; odor aromatic; taste sweet, balsamic, bitterish, and slightly acrid.

The pulpy portion is produced from the coalesced three scales forming the upper whorl of the pistillate catkin. The galbulus ripens in the second year.

Constituents.—Volatile oil ½ to 1½ per cent., sugar 15 to 30 per cent., resins 10 per cent., yellowish juniperin (soluble with green color in ether and volatile oils), wax, fat, proteids, mucilage, ash 4 per cent. Oil of juniper berries is colorless, of about the specific gravity 0.88, levogyre, slightly soluble in 80 per cent. alcohol, fulminates with iodine, and contains pinene, $C_{10}H_{16}$, and other hydrocarbons.

Properties.—Stimulant, diuretic, externally used as an anodyne. *Dose,* 1 to 4 grams (gr. xv–ʒj), in infusion, the concentrated juice, distilled water, and spirit, etc.

PIPER LONGUM.—Long Pepper.

Origin.—1. Píper (Chavíca, *Miquel*) officinárum, *De Candolle,* and, 2. Píper lóngum, *Linné* (Chavíca Roxbúrghii, *Miquel*). *Natural order,* Piperaceæ, Pipereæ.

Habitat.—1. Java and other East Indian islands; 2. Bengal and Philippine Islands.

Description.—Spikes of the coalesced, immature, but full-grown fruit, about 35 millimeters (1⅖ inches) long, and 5 millimeters (⅕ inch) thick, cylindrical, uneven, dusty, blackish-gray; the numerous fruits spirally arranged, each crowned with remnant of style; odor and taste like black pepper. Bengal long pepper is darker colored and shorter, 20 to 25 millimeters (⅘ to 1 inch) long.

Constituents, Properties, and Uses.—Same as those of black pepper.

MORUS.—Mulberry.

Origin.—Mórus rúbra, *Linné.* *Natural order,* Urticaceæ, Moreæ.

Habitat.—North America, from southern Canada to Florida, and west to Dakota and New Mexico; in woods.

Description.—Dense spikes of the coalesced perianths, inclosing the lenticular nutlets; oblong-conical, about 25 millimeters (1 inch) long, dark purple, fleshy and juicy, each fruit crowned with two filiform styles; juice deep purplish-red, sweet and acidulous.

Mórus nígra, *Linné*, has a shorter ovate or oblong fruit, resembling the preceding. The fruit of Mórus álba, *Linné*, is white, reddish, or blackish, sweet, scarcely acidulous.

Constituents.—Sugar about 10 per cent., pectin, citrates, malates, etc.

Properties.—Refrigerant; used for flavoring mixtures.

HUMULUS.—HOPS.

Origin.—Húmulus Lúpulus, *Linné. Natural order*, Urticaceæ, Cannabineæ.

Habitat.—Northern temperate zone; cultivated.

Description.—Ovate, about 3 centimeters (1¼ inches) long, consisting of a thin, hairy, undulated axis, and many obliquely ovate membranous greenish scales, which are in the upper part reticulately veined, and toward the base parallel-veined, glandular, and surrounding a subglobular akene; odor aromatic; taste bitter, aromatic, and slightly astringent.

Constituents.—Volatile oil 0.8 per cent., resin 9–18 per cent., asparagin, choline (see Cannabis), tannin, $C_{25}H_{24}O_{13}$, 3–4 per cent., ash 7–10 per cent. The aromatic and bitter virtues reside in the glands. (See Lupulinum.)

Properties.—Tonic, sedative, anodyne. *Dose*, 2 to 20 grams (ʒss–v), in infusion or tincture; externally as fomentation and poultice.

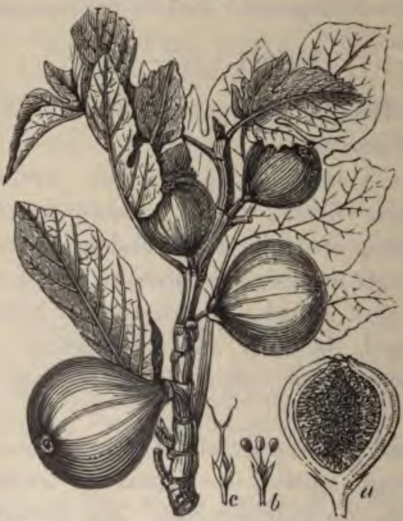
FICUS.—FIG.

Origin.—Ficus Cárica, *Linné. Natural order*, Urticaceæ, Artocarpeæ.

Habitat.—Western Asia; cultivated in subtropical countries.

Description.—Compressed, of irregular shape, fleshy, covered with an efflorescence of sugar, of a sweet fruity odor and very sweet mucilaginous taste. When softened in water, figs are pear-shaped, with a scar or short stalk at base, and a small scaly orifice at apex, near which the staminate flowers are situated; hollow internally, the inner surface covered with numerous yellowish, hard akenes. Figs consist of the fleshy receptacle, which in the unripe state contains an acrid milk-juice.

FIG. 201.



Ficus Carica, *Linné*.—*a*. Section of fig. *b*. Staminate, *c*. Pistillate flowers.

Constituents.—Akenes and cellular tissue 15, water 16, sugar 62 per cent., gum, fat, and salts.

Properties.—Demulcent, laxative; used internally as dietetic; externally as poultice.

ROSA CANINA.—HIPS.

Cynosbata.

Origin.—Rósa canína, *Linné.* *Natural order,* Rosaceæ, Roseæ.

Habitat.—Europe.

Description.—Pitcher-shaped, about 2 centimeters ($\frac{4}{5}$ inch) long, bright red, glossy, fleshy, inner surface bristly, nearly inodorous, and of a sweetish, acidulous somewhat astringent taste. Hips consist of the receptacle (or calyx-tube), are crowned with the five sepals or their remnants, and inclose a number of brown hairy akenes. For medicinal use the akenes and hairs are removed.

Constituents.—Malic acid 7–8, citric acid 2–3, sugar 30, gum 25 per cent., tannin a trace, etc.

Properties.—Refrigerant, mild astringent, diuretic; used as a dietetic and as an excipient in the form of confection.

PHYTOLACCÆ BACCA.—POKEBERRY.

Origin.—Phytolácca decándra, *Linné.* *Natural order,* Phytolaccaceæ, Euphytolacceæ.

Habitat.—North America; naturalized in Europe.

Description.—Depressed globular, dark purple, compound berry about 8 millimeters ($\frac{1}{3}$ inch) in diameter, composed of 10 carpels, each containing one lenticular black seed; juice purplish-red; inodorous, sweet, slightly acrid.

Constituents.—Sugar, gum, coloring matter (turned yellow by alkalies and bleached by sunlight), phytolaccic acid (brownish, amorphous, acrid, precipitated by lead subacetate, soluble in water, sparingly soluble in alcohol, ether, chloroform and glycerin).

Properties.—Alterative, laxative, emetic. *Dose,* 0.5 to 1 gram (gr. viij–xv), in infusion, or the expressed juice in dose of half to one teaspoonful.

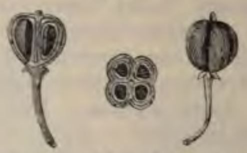
RHAMNUS CATHARTICA.—BUCKTHORN.

Origin.—Rhámnus (Cervispína, *Moench*) cathártica, *Linné.* *Natural order,* Rhamneæ.

Habitat.—Europe and Northern Asia; naturalized in North America.

Description.—Globular, and, after drying, deeply wrinkled, about 5 millimeters (⅕ inch) in diameter, purplish-brown or black, at the base with a convex disk, and a fragile peduncle; fleshy, with a brownish-green pulp and juice; endocarp parchment-like, four-celled, and four-seeded; the seeds dark brown, triangular convex, furrowed on the back; odor slight, unpleasant; taste disagreeable, bitter, and acrid.

FIG. 202.



Rhamnus; fruit, transverse and longitudinal sections.—Natural size.

Constituents.—Rhamnocathartin (amorphous, yellowish), rhamnin (yellowish granules, tasteless, olive-green by ferric salts, yields isodulcit and bright yellow rhamnetin), sugar, gum, tannin; ash about 3 per cent.

Properties.—Cathartic; the expressed juice made into syrup in doses of 10 to 20 grams (f℥ij–v). The juice of the green fruit treated with lime or alumina yields sap-green.

Allied Drugs.—French berries from Rhámnus infectória, *Linné*, and Persian berries from Rhámnus saxátilis, *Linné*, and other species of Rhamnus are collected unripe, resemble buckthorn berries, but are less wrinkled, internally yellowish, from two- to four-seeded, are employed for dyeing yellow, and contain xanthorhamnin, $C_{48}H_{66}O_{29}$ (crystallizes from alcohol in golden-yellow needles; glucoside, yields lemon-yellow rhamnetin), and rhamnegin (yellow powder, freely soluble in alcohol).

RHUS GLABRA.—SUMACH.

Origin.—Rhus glábra, *Linné*. *Natural order*, Anacardiaceæ, Anacardieæ.

Habitat.—North America, west to Colorado and Idaho, in barren soil.

Description.—Subglobular, about 3 millimeters (⅛ inch) in diameter, drupaceous, crimson, densely hairy, containing a roundish-oblong, smooth putamen; inodorous; taste acidulous.

Constituents.—Acid calcium and potassium malates, tannin, coloring matter, etc.

Properties. — Refrigerant, diuretic, astringent; used mostly as gargle in decoction or fluid extract.

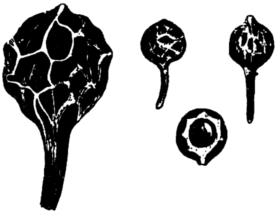
CUBEBA.—CUBEB.

Origin.—Píper Cubéba, *Linné filius* (Cubéba officinális, *Miquel*). *Natural order*, Piperaceæ, Pipereæ.

Habitat.—Java; cultivated.

Description.—Collected unripe. Globular, about 4 to 5 millimeters ($\frac{1}{6}$—$\frac{1}{5}$ inch) in diameter, contracted at the base into a stipe about 6 to 8 millimeters ($\frac{1}{4}$—$\frac{1}{3}$ inch) long, reticulately wrinkled, blackish-gray, the mesocarp with numerous oil cells; internally whitish and hollow, containing a partly developed depressed globular seed with oil cells and starch granules; odor strong spicy; taste pungently aromatic.

Fig. 203.



Cubeb; fruit.—Natural size and magnified.

Cubeb should not be mixed with the nearly inodorous rachis or stalks. Recently the drug often contained a considerable proportion of immature shrivelled cubebs.

Allied Fruits.—Cubéba Lówong, *Miquel*, and C. Wallíchii, *Miquel*. Closely resembling cubeb.

Píper (Cubéba, *Miquel*) canínum, *Dietrich*. Fruit smaller than cubeb; stipe half the length of the globular portion.

Píper (Cubéba, *Miquel*) crássipes, *Korthals*. Fruit larger than cubeb; pedicel stout and flattish; odor agreeable; taste bitter.

False cubebs of unknown origin. Fruit strongly wrinkled, gray-brown, odor macelike; stalk flattened, 4 to 6 millimeters ($\frac{1}{6}$–$\frac{1}{4}$ inch) long, about equal to diameter of fruit.

Constituents.—Volatile oil 5 to 15 per cent., resin 3 per cent., cubebic acid 1 to 3 per cent., cubebin, fat, wax, starch, ash 5–6 per cent. Oil of cubeb is colorless, of spec. grav. 0.92, not freely soluble in 80 per cent. alcohol, levogyre, not fulminating with iodine, of composition $C_{15}H_{24}$, colored red by warm H_2SO_4. Cubeb resin is amorphous, not precipitated by alcoholic solution of lead acetate Cubebic acid is readily soluble in alkali, alcohol, ether, and chloroform, is precipitated by lead acetate, amorphous, some of its salts crystalline. Cubebin is white, pearly, crystalline, inodorous, its alcoholic solution bitter. The three last-mentioned compounds are colored red by sulphuric acid.

Properties.—Stimulant, local irritant, carminative (volatile oil), diuretic (resin and cubebic acid). *Dose*, 1 to 8 grams (gr. xv–ʒij), in powder, fluid extract, or oleoresin.

PIPER.—Black Pepper.

Origin.—Píper nígrum, *Linné*. *Natural order*, Piperaceæ, Pipereæ.

Habitat.—India; cultivated in the tropics.

Description.—Collected unripe. Globular, about 4 millimeters ($\frac{1}{6}$ inch) in diameter, reticulately wrinkled, brownish-black or grayish-black, the mesocarp with scattered oil cells; internally lighter, hollow, with a partly developed embryo; aromatic and of a spicy hot taste.

Constituents.—Volatile oil 1 to 2 per cent., piperine 6 to 8 per cent., volatile alkaloid (probably piperidine) 0.56 per cent., soft, pungent resin or chavicin (soluble in alkalies, alcohol, and ether), fat 7 per cent., proteids 12 per cent., starch in very small granules, ash 5 per cent. Volatile oil of pepper is colorless, not pungent, of spec. grav. 0.864 and composition $C_{10}H_{16}$. Commercial oil of black pepper (so called) contains the pungent resin and fat, and is obtained as a by-product in the preparation of piperine. The latter is $C_{17}H_{19}NO_3$, forms colorless or yellowish prisms, is inodorous, of a slowly developed peppery taste, soluble in alcohol, ether, and benzol, colored blood-red by H_2SO_4, and by alcoholic solution of alkalies decomposed into piperic acid, $C_{12}H_{10}O_4$, and piperidine, $C_5H_{11}N$, which has an ammoniacal and peppery odor. Piperic acid, oxidized with permanganate, yields crystals of piperonal, $C_8H_6O_8$ (artificial heliotropin).

Properties.—Stimulant, irritant, tonic, febrifuge. *Dose*, 0.3 to 1.5 gram (gr. v–xxij), in powder, confection, or oleoresin.

PIPER ALBUM.—WHITE PEPPER.

Origin.—Píper nígrum, *Linné* (see above); the ripe fruit deprived of epicarp and mesocarp.

Description.—Globular, smooth, with ten or twelve veins from base to apex, whitish, and, after the removal of the endocarp, reddish-brown; under the testa an albuminous seed containing small starch grains; odor and taste pepper-like, less pungent.

Constituents and Properties.—Same as black pepper, but more starch and less ash (1 to 1.5 per cent.).

PIMENTA.—PIMENTO.

Semen amomi. Allspice.

Origin.—Eugénia Piménta, *De Candolle*, s. Piménta officinális, *Lindley*. *Natural Order*, Myrtaceæ, Myrteæ.

Habitat.—Tropical America; cultivated.

Description.—Collected unripe. Nearly globular, about 6 millimeters (¼ inch) in diameter, crowned with the short four-parted calyx limb or its remnants and a short style, brownish or brown-gray, granular and glandular, two-celled, each cell with one brown, plano-convex, roundish-reniform seed; pungently aromatic, clove-like; the pericarp and embryo contain oil cells, the latter also starch grains.

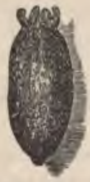
Constituents.—Volatile oil 3 to 4 per cent., resin, fat, tannin, sugar, gum, ash 4 per cent. Oil of pimento has the spec. grav. 1.0374, and contains $C_{15}H_{24}$ and eugenol.

Properties.—Stomachic, stimulant, carminative. *Dose*, 0.5 to 2 grams (gr. viij–xxx), in powder.

CARYOPHYLLI FRUCTUS.—MOTHER CLOVE.

ANTHOPHYLLI.

FIG. 204.



Caryophylli fructus.

Origin. — Eugénia caryophylláta, *Thunberg*, s. Caryophy'llus aromáticus, *Linné*. *Natural order*, Myrtaceæ, Myrteæ.

Habitat.—Molucca Islands; cultivated in the tropics.

Description. — Collected while unripe; oval-oblong, about 20 millimeters (⅘ inch) long, crowned with four calyx teeth, dark brown, two-celled, each cell with one or two seeds; odor and taste clove-like, mild.

Constituents and Properties.—Similar to cloves.

COCCULUS.—Cocculus Indicus. Fishberry.

Origin—Anamírta Cócculus, *Wight et Arnott*, s. An. paniculáta, *Colebrook*. *Natural order*, Menispermaceæ, Tinosporeæ.

Habitat.—East India.

Description—Globular kidney-shaped, about 10 millimeters (⅜ inch) long and 6 millimeters (¼ inch) thick, blackish-brown, wrinkled, the basal and apical scars close together and united by a distinct ridge through the ventral notch, and by an obscure ridge around the convex back; endocarp whitish, thin, on the concave side projecting deeply into the interior; seed semilunar, oily, very bitter; the pericarp nearly tasteless.

Fig. 205.

Cocculus.—Fruit and longitudinal section.

Constituents.—The pericarp contains menispermine (soluble in ether) and paramenispermine (insoluble in ether), two tasteless alkaloids, hypopicrotoxic acid, resin, fat, gum, ash 5 per cent. The seed contains picrotoxin, anamirtin (or cocculin; not bitter or poisonous; sparingly soluble in chloroform and benzol), fat, etc. Picrotoxin $C_{30}H_{34}O_{13}$ is bitter, poisonous, colored brick-red by $KNO_3+H_2SO_4$, and by fractional crystallization from benzol and water separated into picrotoxinin, $C_{15}H_{16}O_6$ (32 per cent., poisonous), and picrotin, $C_{15}H_{18}O_7$ (66 per cent., bitter, not poisonous); these three principles are gradually colored yellow and orange-red by H_2SO_4.

Properties.—Nervine, sedative. *Dose*, 0.1 to 0.2 gram (gr. jss–iij), in powder, of picrotoxin 0.001 gram ($\frac{1}{64}$ grain); externally in decoction for killing vermin.

Antidotes.—Emetics; chloral hydrate; potassium bromide.

ANACARDIUM.—CASHEW NUT.

Origin.—Anacárdium occidentále, *Linné.* *Natural order,* Anacardiaceæ, Anacardieæ.

Habitat.—Tropical America; naturalized in Africa and India.

Description.—Kidney shaped, about 25 millimeters (1 inch) long, 18 millimeters ($\frac{3}{4}$ inch) broad, and 10 millimeters ($\frac{2}{5}$ inch) thick, gray-brown, finely punctate; between the brittle epicarp and endocarp a soft sarcocarp containing a black acrid juice; seed large, of a mild oily taste, and consisting of a brown testa, two plano-convex white cotyledons of the shape of the fruit, and a short radicle curved under the lower inner edge of the fruit.

Constituents.—In the pericarp cardol, $C_{21}H_{30}O_2$ (oily, colorless, soluble in alcohol and ether, very acrid and poisonous), anacardic acid, $C_{22}H_{32}O_3$ (hot taste, not vesicating), resin, tannin, gum, etc.; in the seed a bland fixed oil; ash about 1.5 to 2 per cent.

Properties and Uses.—The pericarp as a rubefacient, epispastic, and caustic; the seed is edible, likewise the fleshy and acidulous pedicel.

SEMECARPUS.—ANACARDIUM ORIENTALE. ORIENTAL CASHEW NUT.

Origin.—Semecárpus Anacárdium, *Linné filius.* *Natural order,* Anacardiaceæ, Anacardieæ.

Habitat.—East India.

Description.—Ovate heart shaped, flattish, about 20 millimeters ($\frac{4}{5}$ inch) long, blackish-brown, in the pericarp with a brown acrid juice; seed white, mild, oily.

Constituents.—In the pericarp an acrid vesicating oil, 32 per cent., perhaps containing cardol. In the seed a bland fixed oil.

Properties.—Local irritant.

MYROBALANUS.—Myrobalan.

Origin.—Terminália Chébula, *Retzius*, and T. bellérica, *Roxburgh*. *Natural order*, Combretaceæ, Combreteæ.

Habitat.—East India.

Description.—Chebulic myrobalans are oblong, roundish-oval, or pyriform, 3 to 5 centimeters (1 to 2 inches) long, more or less distinctly five-angled and five-ribbed, otherwise smooth, orange-colored (smaller and brown or black when collected unripe); sarcocarp of a somewhat resinous fracture; endocarp hard, resinous-dotted, containing a white oily seed; inodorous, strongly astringent. T. citrína, *Roxburgh*, yields a very similar fruit.

Belleric myrobalans are globular or ovoid, 15 to 25 millimeters (⅝ to 1 inch) long, the surface yellowish felt-like.

Constituents.—Gallotannic acid 30 to 45 per cent., gallic acid, resin, mucilage. Belleric myrobalans contain from 6 to 17 per cent. of tannin.

Properties.—Astringent; used for tanning purposes and for preparing tannin.

PRUNUM.—Prune.

Origin. — Prúnus doméstica, *Linné*. *Natural order*, Rosaceæ, Pruneæ.

Habitat.—Western Asia; cultivated in many varieties.

Description.—Oblong or subglobular, shrivelled, blackish-blue, glaucous, the sarcocarp brownish-yellow, sweet and acidulous; putamen hard, smooth or irregularly ridged; the seed almond-like, but smaller, and of a bitter taste. For medicinal use the putamen and seed are rejected.

Constituents.—In the sarcocarp sugar 12 to 25 per cent., pectin, malic acid, salts; in the seed fixed oil, amygdalin, emulsin.

Properties.—The sarcocarp is nutritious and laxative; used as a corrective for senna in decoction and confection.

RUBUS IDÆUS.—Raspberry.

Origin.—Rúbus Idæ'us, *Linné. Natural order,* Rosaceæ, Rubeæ.

Habitat.—Europe and Asia; cultivated.

Description.—Hemispherical, about 12 millimeters (½ inch) broad, with a conical cavity from the separation of the receptacle; red, finely hairy, composed of about 25 small drupes, which are coalesced at the base and each crowned with the remnant of the style; juicy, of an agreeable odor, and a pleasant acidulous taste. The fruit is used in the fresh state only.

Rúbus strigósus, *Michaux,* indigenous to North America, south to North Carolina, and west to New Mexico and Manitoba, closely resembles the preceding; the color of the fruit is a lighter red.

Rúbus occidentális, *Linné,* has a purplish-black fruit. It is indigenous to North America, west to Oregon and south to Georgia and Texas.

The blackberries, Rúbus villósus, *Aiton,* etc., have the fruit united with the receptacle.

Constituents.—Volatile oil a trace, citric and malic acids, sugar about 5 per cent., pectin, coloring matter.

Properties.—Refrigerant, mild laxative, dietetic.

UVA PASSA.—Raisin.

Origin.—Vítis vinífera, *Linné. Natural order,* Ampelideæ.

Habitat.—Western Asia; extensively cultivated in Southern Europe, and in California.

Description.—Shrivelled and flattened, in the fresh state globular, one-celled berries, brownish, somewhat translucent, sweet, and acidulous.

Raisins should be freed from the stalks and seeds.

Varieties.—Large raisins, Passulæ majores, produced in

Spain, Italy, Asia Minor, and California; the Sultana raisins are seedless.

Small raisins, Passulæ minores or Corinthian raisins (often called currants), are chiefly exported from Greece.

Constituents.—In the epicarp tannin and coloring matter; in the pulp grape sugar, acid potassium tartrate, calcium tartrate, little malic acid, mucilage, etc.

Properties.— Nutritive, demulcent, refrigerant, aperient; used as a corrective and flavor of mucilaginous and bitter drinks, etc.

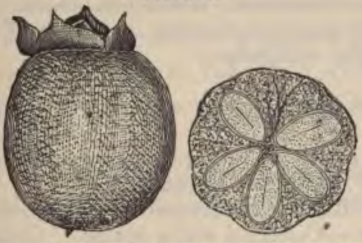
DIOSPYROS.—PERSIMMON.

Origin.—Diospy′ros virginiána, *Linné.* *Natural order,* Ebenaceæ.

Habitat.—United States, south to Florida and Louisiana, west to Kansas; in low grounds and woods.

Description.—Globular or globular-oblong, about 25 millimeters (1 inch) long, green, smooth, at the base with the four-lobed calyx, at the apex with a short remnant of the style, six-celled and six-seeded; odor slight, fruit-like; taste very astringent. After exposure to frost the taste is acidulous and sweet.

FIG. 206.



Diospyros.—Fruit and transverse section, natural size.

Constituents.—Tannin, malic acid, pectin.

Properties.—Astringent. *Dose,* 1 to 4 grams (gr. xv–ʒj), in infusion or tincture.

AURANTII FRUCTUS.—BITTER ORANGE.

Origin.—Cítrus vulgáris, *Risso.* *Natural order,* Rutaceæ, Aurantieæ.

Habitat.—Northern India; cultivated and naturalized in subtropical countries.

Description.—1. Orange berries, Aurantia immatura; the unripe fruit; globular or subglobular, 3 to 20 millimeters (⅛ to ⅘ inch) in diameter, black-green or brownish, granular rugose; at the base with about ten round depressions forming a circular scar; at the apex with a short remnant of the style; hard, containing 8 to 12 cells, each with several undeveloped seeds; agreeably aromatic, very bitter.

2. Bítter orange, Aurantii fructus; the ripe fruit; of the size and shape of a sweet orange, but externally rougher, orange-red, the juice acidulous and bitter.

Constituents.—Volatile oil, hesperidin (somewhat bitter, crystalline glucoside; soluble in cold alkalies; insoluble or sparingly soluble in most simple solvents; yields glucose, isodulcit, and hesperitin, which is sweet and colored red-brown with Fe_2Cl_6), resin, fat, gum, etc.; in the seeds limonin (crystalline, very bitter, precipitated by tannin); in the juice citric acid. The volatile oil of orange berries was formerly sold as essence de petit grain (now often made of the leaves), and contains hesperidene, $O_{10}H_{16}$ (like the oil of bitter orange, obtained by grating the epicarp), linalool, $C_{10}H_{18}O$, and its acetic ester. Orange berries yield 5 to 6 per cent. of ash.

Properties.—Stimulant, stomachic, tonic. *Dose*, 1 to 2 grams (gr. xv–xxx), in tincture or wine. The juice of the ripe fruit is also refrigerant.

BELA.—BAEL. BENGAL QUINCE.

Origin.—Aégle (Cratæ'va, *Linné*) Mármelos, *Correa*. *Natural order*, Rutaceæ, Aurantieæ.

Habitat.—Himalaya Mountains; cultivated in India.

Description.—Collected while unripe. Globular or subglobose, 5 to 10 centimeters (2 to 4 inches) in diameter, about twelve-celled; in commerce often in fragments, consisting of a brownish-gray, smooth, hard rind, 2 to 3 millimeters ($\frac{1}{12}$ to ⅛ inch) thick, to which a hard mucilaginous, somewhat acidulous, red-brown and internally whitish pulp is adhering, inclosing oblong flat, woolly seeds; somewhat aromatic; mucilaginous, slightly acidulous, and faintly astringent; the infusion is scarcely affected by iron salts.

Adulterations.—Garcínia Mangostána, *Linné*. *Natural order*, Guttiferæ. Mangosteen rind is thicker than bael rind, deep brown, without adhering pulp, and of an astringent taste; a radiating sessile stigma is attached to some of the pieces.

Constituents.—Mucilage, pectin, sugar, and traces of tannin, bitter principle, and volatile oil; ash 3 per cent.

Properties.—Mild astringent. *Dose,* 1 to 3 grams (gr. xv–xlv), in infusion or fluid extract.

LIMON.—LEMON.

Origin.—Cítrus Limónum, *Risso.* *Natural order,* Rutaceæ, Aurantieæ.

Habitat.—India; cultivated in subtropical countries.

Description.—Used in the fresh state. Oval or obovate with a nipple-shaped apex, about 75 millimeters (3 inches) long, yellow, nearly smooth, but ruggedly glandular; internally divided into from 8 to 12 cells, each with 2 or 3 seeds and containing an acid juice; the rind fragrant and somewhat bitter (see Limonis cortex).

Constituents.—Yield of juice 20 to 30 grams (ʒv–vijss); spec. grav. about 1.04; yellowish; contains 7 to 9 per cent. of citric acid, a little malic acid, and mucilage, and yields not over ½ per cent. of ash. On keeping lemons for several months, the citric acid is decomposed into sugar and carbonic acid.

Properties.—Refrigerant. *Dose* of the juice, 8 to 20 grams (ʒij–v), diluted with water and as syrup.

CAPSICUM.—CAYENNE PEPPER, BIRD PEPPER.

Origin.—Cápsicum fastigiátum, *Blume.* *Natural order,* Solanaceæ, Solaneæ.

Habitat.—Probably tropical America; cultivated in tropical countries.

Description—Conical or oblong ovate, from 10 to 20 millimeters (⅖ to ⅘ inch) long, obtusely pointed, supported by a flattish, cup-shaped five-toothed calyx; pericarp red, shining, membranous, and translucent, inclosing two cells, and about eighteen flat, reniform, yellowish seeds attached to a thick central placenta. It has a peculiar odor and an intensely hot taste.

The fruit of Cápsicum ánnuum, *Linné*, is larger, 5 to 8 centimeters (2 to 3¼ inches) long, oblong-conical, sometimes curved or subglobular; the fruit of C. cerasifórme, *Willdenow*, is of the size and shape of a cherry.

Constituents.—Capsaicin, $C_9H_{14}O_2$, about 0.02 per cent. (mainly in the placenta), fixed oil, fat acids, trace of volatile oil, waxy matter, resin, coloring matter, trace of volatile alkaloid having the odor of conine, ash 4–5 per cent. Capsaicin is crystalline, colorless, fusible, volatile, extremely acrid, soluble in alcohol, ether, benzol, and fixed oils. T. Pabst (1892) obtained it as an amorphous resin-like acid, to which the red coloring matter persistently adheres. The alkaloid does not exist in the fresh fruit. The free fat acids are oleic, stearic, and palmitic acids.

Properties.—Stimulant, stomachic, powerful rubefacient. *Dose*, 0.1 to 0.5 gram (gr. jss–viij), in powder, infusion, tincture, or oleoresin; externally in liniments and plasters.

COLOCYNTHIS.—COLOCYNTH.

Origin. — Citrúllus (Cúcumis, *Linné*) Colocy'nthis, *Schrader*. *Natural order*, Cucurbitaceæ, Cucumerineæ.

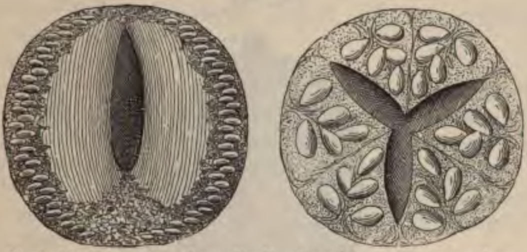
Habitat.—Southern and Western Asia, Northern and Southern Africa, Greece, and Spain.

Description.—Deprived of the smooth, light brownish-yellow rind. Globular, 5 to 10 centimeters (2 to 4 inches) in diameter, white or yellowish-white, light, spongy, readily breaking into three wedge-shaped pieces, each containing near the rounded surface many flat, ovate, white or brown seeds; inodorous; taste intensely bitter.

The pulp alone (about 30 per cent. of the peeled fruit), deprived of the seeds, should be employed. Hard and dark-colored colocynth should be rejected.

Constituents.—Colocynthin, about 0.6 per cent., resin, colocynthitin (tasteless crystalline resin), pectin, gum, 11 per cent. ash; no starch. Colocynthin is yellow, amorphous, or crystalline, soluble in water and alcohol, very bitter, and splits into sugar and resinous colocynthein. The seeds contain little bitter principle, 17 per cent. of fixed oil, no starch, 6 per cent. of albuminoids, and 2.5 to 3 per cent. of ash.

FIG. 207.



Peeled Colocynth.—Longitudinal and transverse section.

Properties.—Drastic purgative, in overdoses emetic and irritant poison. *Dose*, 0.1 to 0.5 gram (gr. jss–viij), in powder, tincture, or extract.

Antidotes.—Evacuants; demulcents; opium; stimulants.

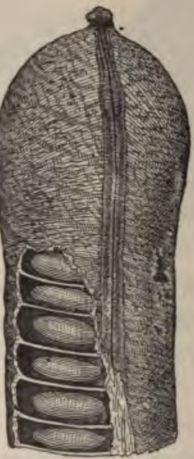
CASSIA FISTULA.—PURGING CASSIA.

Origin. — Cássia (Cathartocárpus, *Persoon*) Fístula, *Linné*. *Natural order*, Leguminosæ, Cæsalpineæ, Cassieæ.

Habitat.—East India; naturalized in tropical Africa and America.

Description.—Cylindrical, 45 to 60 centimeters (18 to 24 inches) long, nearly 25 millimeters (1 inch) in diameter; pericarp blackish-brown, woody, somewhat veined, the sutures smooth, forming two longitudinal bands, the ventral band with a shallow groove, and the dorsal one with a fine ridge; indehiscent; internally divided transversely into numerous cells, each containing an ovate, flattish, reddish-brown and glossy seed imbedded in a blackish-brown sweet pulp; odor resembling prunes.

FIG. 208.



Cassia Fistula.—Part of pod, natural size.

Other Varieties. — Cássia moscháta, *Kunth*, of New Granada, perhaps also C. bacciláris, *Linné filius*, of Surinam. 30 to 50 centimeters (12 to 20 inches) long, about 15 millimeters ($\frac{3}{5}$ inch) thick; often curved; the pericarp and pulp of a lighter color than in Cassia Fistula.

Cássia brasiliána, *Lamarck*, s. C. grándis, *Linné filius*, of Brazil. 60 centimeters (24 inches) or more long, laterally compressed, about 40 millimeters ($1\frac{1}{2}$ inches) broad, black-brown, coarsely veined, the sutures prominent.

Constituents.—The pulp (yield about 30 per cent.) contains sugar 60 per cent., mucilage, pectin, albuminoids, salts (calcium oxalate).

Properties.—Laxative. *Dose,* 4 to 10 grams (ʒj–ijss); used for confection of senna.

CERATONIA.—St. John's Bread.

Siliqua dulcis.

Origin.—Ceratónia Síliqua, *Linné.* *Natural order,* Leguminosæ, Cæsalpinieæ, Cassieæ.

Habitat.—Southern Europe.

Description.—Broadly linear, about 15 centimeters (6 inches) long, 2 centimeters (4/5 inch) broad, and 4 millimeters (1/6 inch) thick, flat, thickened and grooved on the edges; epicarp leathery, brown, glossy; sarcocarp red-brown, pulpy; internally divided transversely into from 6 to 12 cells, each containing an ovate, flattish, glossy brown hard seed; odor sweetish, taste mucilaginous and sweet.

Constituents.—Sugar 40 to 50 per cent., mucilage, pectin, albuminoids, isobutyric acid 0.6 per cent., little tannic, capronic, and other acids.

Properties.—Demulcent, laxative; used as an addition to expectorant mixtures.

PAPAVER.—Poppy.

Origin.—Papáver somníferum, *Linné.* *Natural order,* Papaveraceæ, Papavereæ.

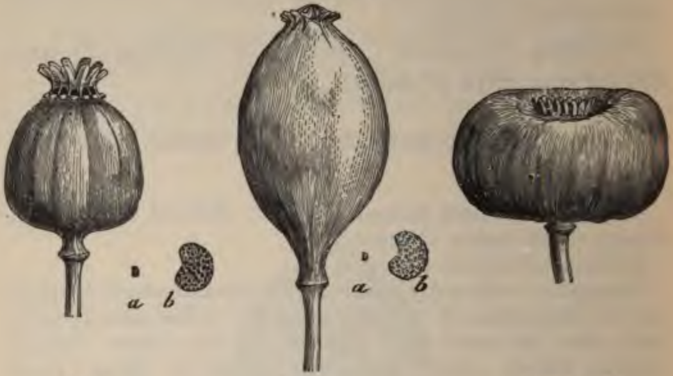
Habitat.—Western Asia; cultivated.

Description.—The capsules are collected when nearly ripe and freed from the seeds. Globular-ovate or ovate-oblong, grayish green or light yellowish-brown, smooth, crowned with the sessile, peltate, many-rayed stigma, one-celled, but on the inner surface furnished with numerous vertical projecting placentas; of a slight odor and bitter taste.

Constituents.—Alkaloids in variable proportion, from traces to 0.10, occasionally as much as 2 per cent., consisting of morphine, narcotine, rhœadine, narceine, codeine, and papaverosine; little meconic acid; citric and tartaric acids, mucilage, wax, ash about 14 per cent.

Properties.—Anodyne, hypnotic, sedative. *Dose,* 1 to 2 grams (gr. xv–xxx), in decoction, syrup, and extract; externally as poultice.

FIG. 209.



Black. White. Depressed.

Poppy capsules and seeds (*a*, natural size; *b*, magnified).

CHENOPODIUM.—WORMSEED.

Origin.—Chenopódium ambrosoídes, *Linné*, var. anthelmínticum, *Gray*. *Natural order*, Chenopodiaceæ, Euchenopodieæ.

Habitat.—West Indies and Central America; naturalized in the United States.

Description.—Nearly 2 millimeters ($\frac{1}{12}$ inch) in diameter, depressed globular, glandular, dull greenish or brownish, the integuments friable, containing a lenticular, obtusely-edged, glossy, black seed, with a strongly curved embryo; odor peculiar, somewhat terebinthinate; taste bitterish, pungent.

Constituents.—Volatile oil, spec. grav. 0.91, consists of $C_{10}H_{16}$ and $C_{10}H_{16}O$.

Properties.—Anthelmintic. *Dose*, 1 to 3 grams (gr. xv–xlv), in powder or electuary; the volatile oil 5 to 10 or 15 drops.

XANTHOXYLI FRUCTUS.—PRICKLY ASH FRUIT.

Origin.—Xanthóxylum (Zanthóxylum) caroliniánum, *Lambert* (X. Cláva-Hérculis, *L.*), and X. fraxíneum, *Willdenow* (X. americánum, *Miller*). *Natural order,* Rutaceæ, Zanthoxyleæ.

Habitat.—United States; the first species near the coast from Virginia to Eastern Texas; the second species in rocky woods in the Northern and Central States.

Description.—Two or three carpels sessile on the thin receptacle (X. carolinianum), or three to five carpels upon short stalks from the thin peduncle (X. fraxineum); each capsule somewhat obliquely globular, 4 or 5 millimeters (1/6 or 1/5 inch) in diameter; pericarp brown-greenish or yellowish-brown, pitted and somewhat wrinkled, firm, two-valved, dehiscent by the inner suture and the upper half of the outer suture, valves spreading; each carpel contains one subglobular, or two somewhat flattened, black, glossy, and more or less wrinkled seeds, with a crustaceous testa inclosing a white fleshy albumen and embryo; odor somewhat aromatic; taste pleasantly pungent, the seeds slightly bitter.

Constituents.—Little volatile oil, resin, fat.

Properties.—Stimulant, tonic. *Dose,* 1 to 2 grams (gr. xv-xxx).

ILLICIUM.—STARANISE.

Origin.—Illícium vérum, *Hooker filius.* *Natural order,* Magnoliaceæ, Wintereæ.

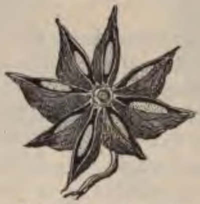
Habitat.—Northern Anam.

Description.—Eight follicles, stellately arranged around a central column about 5 millimeters (1/5 inch) long; carpels 12 to 15 millimeters (1/2 to 5/8 inch) long, boat-shaped, somewhat woody, wrinkled, with a straight beak, rusty-brown, split along the upper suture; internally red-brown and glossy, containing a flattish, oval, glossy brown seed; odor anise-like; taste sweet, aromatic; the seeds oily. 100 parts of fruit yield 78 parts of capsules and 22 parts of seed.

Adulteration.—Illícium religiósum, *Siebold,* indigenous to China and Corea, cultivated in Japan. Shikimi fruit.

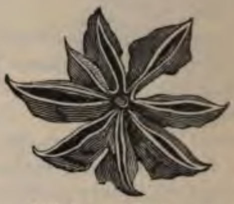
Poisonous. The fruit resembles the preceding, but the carpels are more woody, shrivelled and wrinkled, and have a thin beak, mostly turned upward, a faintly aromatic, somewhat clove-like odor, and a disagreeable taste.

FIG. 210.



Illicium anisatum.

FIG. 211.



Illicium religiosum.

Constituents.—Volatile oil (from the capsules 5.3 per cent., from the seeds 1.8 per cent.), fat (from the capsules 2.8 per cent., from the seeds 20 per cent.), saponin, protocatechuic acid, shikimic acid, $C_7H_{10}O_5$ (crystalline, not poisonous), resin, mucilage, ash about 2 per cent. The volatile oil differs slightly from that of anise fruit in odor and taste, and also in that it usually congeals, if at rest, at about 1° C. (34° F.), the temperature rising to about 10° C. (50° F.); it acquires a pale brown color with an alcoholic solution of HCl; it consists chiefly of anethol, $C_{10}H_{12}O$, with small quantities of terpenes, safrol, ethylester of hydroquinone, anisic acid, etc.

Shikimi (Sikimi) fruit contains 0.44 per cent. of non-solidifying volatile oil, spec. grav. 1.006, shikimic acid, sikimipicrin (crystalline, bitter), and sikimin, the poisonous crystalline principle, soluble in alcohol, glacial acetic acid, ether, and chloroform; sparingly soluble in water and alkali; insoluble in benzin. The volatile oil contains safrol and eugenol.

Properties.—Carminative, anodyne, stimulant, diuretic.

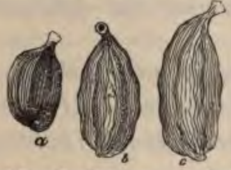
Dose, 0.5 to 1.5 grams (gr. viij–xxiij); mostly used for flavoring.

CARDAMOMUM.—CARDAMOM.

Origin.—Elettária (Alpínia, *Roxburgh,* Amómum, *White*) Cardamómum, *Maton. Natural order,* Scitamineæ, Zingibereæ.

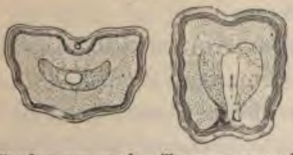
Habitat.—Malabar; cultivated in India.

FIG. 212.



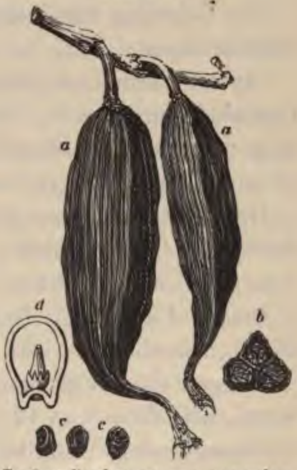
Malabar Cardamom.—*a,* short; *b,* medium; *c,* long.

Fig. 213.



Cardamom seed.—Transverse and longitudinal section, magnified 5 diam.

FIG. 214.



Ceylon Cardamom.—*a,* capsules; *b,* transverse section of capsule; *c,* seeds: *d,* section of seed with embryo, magnified.

Description.—Ovoid or oblong, from 1 to 2 centimeters ($\frac{2}{5}$ to $\frac{4}{5}$ inch) long, obtusely triangular, rounded at the base, short-beaked, longitudinally striate, of a pale buff color, three-celled, with a thin, leathery, nearly tasteless pericarp and a central placenta; seeds about 20, about 4 millimeters ($\frac{1}{6}$ inch) long, reddish-brown, irregularly angular, transversely rugose, depressed at the hilum, surrounded by a thin membranous arillus, of an agreeable odor, and a pungent aromatic taste; the integuments nearly tasteless. 100 parts of fruit yield 22 parts of capsules and 78 parts of seeds.

Varieties.—Malabar Cardamom, the most esteemed, of a light buff color, plump.

Aleppy Cardamom, mostly short, of a greenish tint.

Madras Cardamom, of a pale color, oblong, somewhat attenuated above.

The following varieties are of a somewhat different and inferior flavor:

Ceylon Cardamom, from Elettária májor, *Smith*, s. E. Cardamómum, var. β. Nearly 40 millimeters ($1\frac{3}{5}$ inches) long, triangular, prolonged into a beak about 15 millimeters ($\frac{3}{5}$ inch) long, dark gray-brown.

Round Cardamom, globular or globular-ovate, from Amómum Cardamómum, *Linné*, of Siam and Java, and Am. globósum, *Loureiro*, of China

Bengal Cardamom, from Amómum aromáticum, *Roxburgh*, near the apex with 9 wings.

Winged Java Cardamom, from Am. máximum, *Roxburgh*, with from 9 to 12 wings from base to apex.

Constituents.—Volatile oil 4 to 5 per cent., fixed oil 10 to 11 per cent., starch in minute granules, albuminoids, mucilage, ash about 6 per cent., and in Ceylon cardamom 15 per cent, containing 0.8 per cent. of manganese.

Properties.—Carminative, stomachic, stimulant. *Dose*, 0.3 to 1 gram (gr. v–xv), in powder, infusion, or tincture.

VANILLA.—VANILLA.

Origin.—Vanílla planifólia, *Andrews*. *Natural order*, Orchideæ, Neottieæ.

Habitat.—Eastern Mexico, in hot damp woods; cultivated in the tropics.

Description.—Collected before ripe; the color and aroma developed by sweating. Linear, obscurely triangular, from 15 to 25 centimeters (6 to 10 inches) long, narrowed and bent or hooked at the base, rather oblique at the apex, wrinkled, somewhat warty, dark brown, glossy, leathery, one-celled, containing a blackish-brown fragrant pulp with numerous minute black seeds and more or less acicular crystals.

Varieties.—Mexican Vanilla, the finest quality.

Bourbon Vanilla, rather shorter and lighter than the preceding, the odor suggestive of tonka.

Venezuelan Vanilla, about 10 centimeters (4 inches) long, thick; resembling tonka in odor; probably from Vanílla guianénsis, *Splitberger.*

Brazilian Vanilla, vanillon, from Vanílla Pompóna, *Schiede,* longer and thicker than the preceding; of an inferior vanilla odor; contains about 0.5 per cent. vanillin.

Constituents.—Vanillin, $C_8H_8O_3$ (1.7 per cent. in Mexican, 2 per cent. in Bourbon, and 2.75 in Java vanilla, in the last two associated with odorous oil), fixed oil 11 per cent., resin, sugar, mucilage, ash 4 to 5 per cent. Vanillin is the aldehyd of methyl-protocatechuic acid, and is prepared artificially from coniferin (in the sap-wood of pines), carbolic acid, eugenol, and guaiacol. It forms colorless needles, melts at 81° C.; is easily soluble in alcohol, ether, and chloroform, also in carbon disulphide and water; combines with bases, and the solution is colored blue or green with Fe_2Cl_6.

Properties.—Carminative, stimulant, aphrodisiac, antihysteric. *Dose,* 0.3 to 2 grams (gr. v–xxx), in powder, tincture, or syrup.

HORDEI FRUCTUS.—Barley.

Origin.—Hórdeum dístichum, *Linné.* *Natural order*, Gramineæ, Hordeeæ.

Habitat.—Probably Western Asia; cultivated.

Description.—Elliptic, about 9 millimeters ($\frac{3}{8}$ inch) long, tapering toward both ends, and somewhat truncate, flattish upon the back, somewhat angled on the sides, with a groove along the front, smooth and grayish-yellow from the adherent paleæ, after their removal pale brownish; pericarp coalesced with the testa, and inclosing a layer of gluten, covering the central parenchyme filled with starch; taste farinaceous.

Maltum.—Malt is barley germinated until the thin germ reaches nearly the length of the fruit, then dried; taste sweetish. Loss in weight from 10 to 20 per cent.

Constituents.—Barley: starch 60–68, proteids 12–16, fat 3, ash 3 per cent., little sugar.

Malt: diastase, dextrin, sugar, starch, etc.; about 60 to 65 per cent. soluble in water.

Properties.—Nutritious.

LAPPÆ FRUCTUS.—Burdock Fruit.

Origin.—A′rctium Láppa, *Linné* (Láppa officinális, *Alloini*). *Natural order*, Compositæ, Cynaroïdeæ.

Habitat.—Asia and Europe; naturalized in North America, in waste places.

Description.—Obovate-oblong, about 6 millimeters ($\frac{1}{4}$ inch) long, somewhat curved and angled, roughish-wrinkled, brown-gray, easily deprived of the short stiff-hairy pappus; inodorous, bitter.

The fruit of Sílybum mariánum, *Gaertner*, or Marythistle of Southern Europe, is of similar appearance, obovate, about 5 millimeters ($\frac{1}{5}$ inch) long, flattish, smooth, mucilaginous, and somewhat bitter.

Constituents.—Bitter principle (white glucoside, granular, soluble in water, alcohol, and chloroform), fixed oil, resin.

Properties.—Tonic, in psoriasis. *Dose*, 1 to 2 grams (gr. xv–xxx), in tincture.

CANNABIS.—HEMPSEED.

Origin.—Cánnabis satíva, *Linné.* *Natural order*, Urticaceæ, Cannabineæ.

Habitat.—Asia; cultivated in many countries.

Description.—Oval or subglobular, about 4 millimeters (⅙ inch) long, slightly compressed, with a whitish keel on the margin; testa greenish-gray or brownish, veined, glossy, brittle, inclosing a single oily seed; odor slight; taste oily and sweet.

Constituents.—Greenish drying oil 30 per cent., albuminoids 24 per cent., sugar, mucilage, resin, ash 5 per cent.

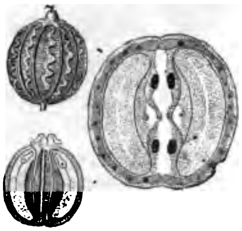
Properties.—Demulcent and anodyne in the form of emulsion; mostly used for obtaining the oil.

CORIANDRUM.—CORIANDER.

Origin.—Coriándrum satívum, *Linné.* *Natural order*, Umbelliferæ, Caucalineæ.

Habitat.—Central Asia and Southern Europe; cultivated.

FIG. 215.



Coriandrum.—Fruit and longitudinal section, magnified 3 diam.; transverse section, magnified 8 diam.

Description.—Globular, 4 or 5 millimeters (⅙ or ⅕ inch) in diameter, crowned with the calyx teeth, brownish-yellow, smooth; the two mericarps cohering, inclosing a lenticular cavity, and each furnished on the face with two oil-tubes, and on the back with five wavy slightly raised ribs and with four rather more prominent ridges; odor and taste agreeably aromatic.

Constituents.—Volatile oil ½ to 1 per cent., fat 13 per cent., mucilage, ash 5 per cent. The volatile oil contains dextropinene and coriandrol, $C_{10}H_{18}O$, the latter boiling at 195° C.

Properties.—Carminative, stimulant, stomachic. *Dose*, 0.5 to 2 grams (gr. viij–xxx).

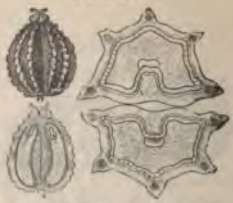
CONII FRUCTUS.—Conium Fruit, Hemlock Fruit.

Origin.—Coníum maculátum, *Linné.* *Natural order*, Umbelliferæ, Ammineæ.

Habitat.—Europe and Asia; naturalized in North America.

Description.—The fruit is gathered when full grown, while yet green. About 3 millimeters (⅛ inch) long, broadly ovate, laterally compressed, gray-green, smooth, often divided into the two mericarps, and these with five crenate ribs, without oil-tubes, and containing a seed which is grooved on the face; odor and taste slight; triturated with solution of potassa, a strong disagreeable odor is given off.

Fig. 216.



Conium.—Fruit and longitudinal section, magnified 3 diam.; transverse section, magnified 8 diam.

Constituents.—Conine, $C_8H_{17}N$, $\frac{1}{5}$–$\frac{1}{2}$ per cent., methylconine, $C_8H_{16}CH_3N$, conydrine and pseudoconydrine, $C_8H_{17}NO$, little volatile oil, fixed oil, ash 6 per cent. Conine is colorless, oily, of spec. grav. 0.88, boiling-point 166° C. (331° F.), of a disagreeable odor and an acrid taste, soluble in alcohol, ether, and water, less in hot water. Methylconine resembles conine. Conydrine is in iridescent scales, melts at 120.6° C. (249° F.), boils at 224.5° C. (436° F.), is less poisonous than conine, and with P_2O_5, yields poisonous coniceine, $C_8H_{15}N$. Pseudoconydrine melts at 100° C., and boils at 230° C. (446° F.).

Properties.—Sedative, narcotic. *Dose*, 0.1 to 0.3 gram (gr. jss–v); of conine, 0.005 gram (gr. $\frac{1}{12}$).

Antidotes.—Evacuants (stomach pump, emetics); astringents; stimulants; friction of extremities.

ANISUM.—Anise.

Origin.—Pimpinélla Anísum, *Linné*. *Natural order*, Umbelliferæ, Ammineæ.

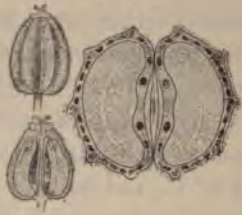
Habitat.—Western Asia, Egypt, Southeastern Europe; cultivated.

Description.—Four or 5 millimeters ($\frac{1}{6}$–$\frac{1}{5}$ inch) long, ovate, compressed at the sides, grayish, finely hairy, and consisting of two mericarps, each with a flat face, five light brownish filiform ridges, and about fifteen or more thin oil-tubes; odor agreeable, aromatic; taste sweet, spicy.

Italian anise often contains a small quantity of the fruit of conium, which is usually in separate mericarps, smooth, grooved upon the face, and has no oil-tubes.

Constituents.—Volatile oil 1½–3 per cent., fixed oil 3–4 per cent., sugar, mucilage, ash about 7 per cent. Oil of anise is colorless or yellowish, of spec. grav. 0.98, and congeals, if at rest, at about 10° C. (50° F.), the temperature rising to about 15° C. (59° F.). With alcoholic solution of HCl it affords a pink color. It consists chiefly of anethol, $C_{10}H_{12}O$, having the melting-point 21° C. (70° F.), and spec. grav. 0.986 at 25° C. (77° F.).

Fig. 217.



Anisum.—Fruit and longitudinal section, magnified 3 diam.; transverse section, magnified 8 diam.

Properties.—Carminative, stimulant, stomachic. *Dose*, 0.5 to 2 grams (gr. viij–xxx), in powder, spirit, volatile oil.

APIUM—Celery Fruit.

Origin.—A'pium gravéolens, *Linné*. *Natural order*, Umbelliferæ, Ammineæ.

Habitat.—Levant and Southern Europe; cultivated.

Description.—About 1 millimeter ($\frac{1}{25}$ inch) long, roundish-ovate, laterally compressed, brown, smooth, mostly divided into the two mericarps, and these with 5 filiform ribs, flat on the face, and containing about 12 oil-tubes; aromatic.

Constituents.—Volatile oil, spec. grav. 0.88, fixed oil, mucilage.

Properties.—Carminative, stimulant, used for flavoring.

PETROSELINUM.—Parsley Fruit.

Origin.—Cárum (A'pium, *Linné*) Petroselínum, *Baillon* (Petroselínum satívum, *Hoffmann*). *Natural order*, Umbelliferæ, Ammineæ.

Habitat.—Levant, Southern Europe, extensively cultivated.

Description.—About 2 millimeters ($\frac{1}{12}$ inch) long, ovate, laterally compressed, greenish- or brownish-gray, smooth, mostly divided into the two mericarps, and these with 5 filiform pale-colored ribs, flat on the face, and containing 6 oil-tubes; aromatic.

Constituents.—Volatile oil 1½ to 3 per cent., fixed oil 12 per cent., resin 5 per cent., apiin, apiol, mucilage, ash 7 per cent. The crude volatile oil contains much stearopten, volatilizing with difficulty. Pure apiol, $C_{12}H_{14}O_4$, forms long needles, has a faint parsley odor, spec. grav. 1.015, melting point 30° C. (86° F.), boiling point 294° C., soluble readily in alcohol and ether, in H_2SO_4 with blood-red color, with HNO_3 yields oxalic acid. Apiin is tasteless, crystallizes in silky needles, with hot water forms a jelly, and with acids yields glucose and apigenin.

Properties.—Carminative, stimulant, diuretic. *Dose*, 0.5 to 2 grams (gr. viij–xxx), in powder, infusion, or spirit. Impure apiol, 0.2 to 0.5 gram (gr. iij–viij), was recommended as a febrifuge.

AJOWAN.—AJOWAN.

Origin.—Cárum (Ptychótis, *De Candolle*) A'jowan, *Bentham et Hooker*. *Natural order*, Umbelliferæ, Ammineæ.

Habitat.—India, Persia, Egypt.

Description.—About 2 millimeters ($\frac{1}{12}$ inch) long, ovate, laterally compressed, gray-brown, rough and finely warty, usually divided into the two mericarps, and these with five thin ribs, flat on the face, and with 6 oil-tubes; odor aromatic, thyme-like; taste pungent, aromatic.

Constituents.—Volatile oil 5 to 6 per cent. (spec. grav. 0.896; contains cymene, $C_{10}H_{14}$, and thymol, $C_{10}H_{14}O$), ash about 10 per cent.

Properties.—Carminative, stimulant; used for preparing thymol.

FŒNICULUM.—FENNEL.

Origin.—Fœnículum vulgáre, *Gaertner*, s. F. capilláceum, *Gilibert*. *Natural order*, Umbelliferæ, Seselineæ.

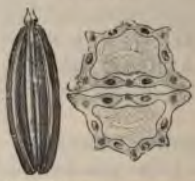
Habitat.—Levant and Southern Europe; cultivated.

Description.—Oblong, nearly cylindrical, slightly curved, 5 or 6 millimeters ($\frac{1}{5}$ or $\frac{1}{4}$ inch) long, brownish or greenish-brown; readily separable into the two mericarps, and these with five light brown conspicuous obtuse ribs, 4 oil-tubes on the back and 2 or 4 oil-tubes upon the flat face; odor and taste aromatic, anise-like.

Varieties.—Saxon or German Fennel, described above.

Roman Fennel. Larger than the preceding, 8 to 12 millimeters ($\frac{1}{3}$ to $\frac{1}{2}$ inch) long.

Fig. 218.



Fœniculum.—Fruit, 3 diam.; transverse section, 8 diam.

Bitter Fennel, collected in Southern France from wild growing plants; smaller, 3 to 5 millimeters ($\frac{1}{8}$ to $\frac{1}{5}$ inch) long; taste bitterish and spicy.

Constituents.—Volatile oil 2 to 6 per cent., fixed oil 12 per cent., sugar, mucilage, ash about 7 per cent. Oil of fennel is colorless or yellowish, sweet, of spec. grav. 0.97, congeals below 10° C. (50° F.), and contains phellandrene, $C_{10}H_{16}$, and both solid and liquid anethol.

Properties.—Carminative, stimulant, stomachic, galactagogue. *Dose*, 0.5 to 2 grams (gr. viij–xxx), in powder, spirit, volatile oil.

PHELLANDRIUM.—WATER-DROPWORT.

Five-leaved water hemlock.

Origin.—Œnánthe Phellándrium, *Lamarck*, s. Phellándrium aquáticum, *Linné*. *Natural order*, Umbelliferæ, Seselineæ.

Habitat.—Europe and Northern Asia.

Description.—Oblong or oblong-ovate, 4 or 5 millimeters ($\frac{1}{6}$ to $\frac{1}{5}$ inch) long, nearly terete, brown or blackish-brown, smooth, each mericarp with five broad and obtuse ribs, four narrow grooves, and 6 oil-tubes; odor caraway-like, but unpleasant; taste aromatic bitter, somewhat acrid.

Constituents.—Volatile oil 1 to 1½ per cent., fixed oil, resin, mucilage, ash about 8 per cent.

Properties.—Carminative, stimulant, diaphoretic, diuretic. *Dose*, 1 to 2 or 4 grams (gr. xv–xxx–ʒj), in powder or infusion.

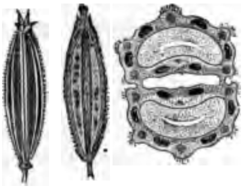
CUMINUM.—CUMIN FRUIT.

Origin.—Cumínum Cymínum, *Linné.* *Natural order*, Umbelliferæ, Caucalineæ.

Habitat.—Northeastern Africa; cultivated.

Description.—Oblong, 5 or 6 millimeters (⅕ or ¼ inch) long, narrowed at both ends, laterally compressed, brown, rough-hairy; each mericarp with 5 filiform yellowish ribs, 4 broader ones of a brown color, and 6 oil-tubes; odor and taste peculiar, somewhat like caraway.

FIG. 219.



Cumin.—Fruit and longitudinal section, 3 diam.; transverse section, 8 diam.

Constituents.—Volatile oil 1 to 3 per cent., fixed oil, resin, mucilage, ash 8 per cent. Oil of cumin is of spec. grav. 0.92, and consists chiefly of cymol or cymene, $C_{10}H_{14}$, and cuminol or cuminaldehyd, $C_{10}H_{12}O$.

Properties.—Carminative, stimulant, antispasmodic. *Dose*, 0.5 to 2 grams (gr. viij–xxx), in powder or volatile oil.

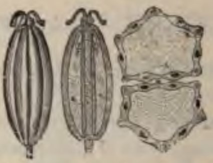
CARUM.—CARAWAY.

Origin.—Cárum Cárui, *Linné.* *Natural order*, Umbelliferæ, Ammineæ.

Habitat.—Central and Western Asia; cultivated.

Description.—Oblong, laterally compressed, 4 or 5 millimeters ($\frac{1}{6}$ or $\frac{1}{5}$ inch) long, brown, smooth, usually separated into the two mericarps, and these curved, narrower at both ends, with five pale-colored filiform ribs, and with six oil-tubes; seed upon transverse section pentagonal; odor aromatic, agreeable; taste sweetish, spicy.

Fig. 220.



Carum.—Fruit and longitudinal section, 3 diam.; transverse section, 8 diam.

Constituents.—Volatile oil 5 to 7 per cent., fixed oil, resin, sugar, mucilage, little tannin, ash 5 per cent. Oil of caraway has the spec. grav. 0.96, and consists of carvene, $C_{10}H_{16}$, and chiefly of carvol, $C_{10}H_{14}O$ (boiling-point 227° C.). A strong solution of the oil in alcohol mixed with ammonia and treated with H_2S, yields white needles of $(C_{10}H_{14}O)_2H_2S$.

Properties.—Carminative, stimulant, diuretic. *Dose,* 0.5 to 2 grams (gr. viij–xxx), in powder, infusion, spirit, and volatile oil.

ANETHUM.—Dill.

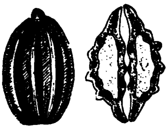
Origin.—Anéthum (Peucedánum, *Hiern*) gravéolens, *Linné.* *Natural order,* Umbelliferæ, Peucedaneæ.

Habitat.—Levant and Southern Europe; cultivated.

Description.—Oblong or oval, about 4 millimeters ($\frac{1}{6}$ inch) long, dorsally compressed, brown, smooth, usually separated into the two thin mericarps, and these with six oil-tubes and with five ribs, of which three are filiform and the two lateral ones broadly winged and light-colored; odor and taste spicy, caraway-like.

Constituents.—Volatile oil 3 to 4 per cent., fixed oil, mucilage. Oil of dill has the spec. grav. 0.87, and contains 60 per cent. anethene, $C_{10}H_{16}$ (of a lemon-like odor, and boiling point 170° C.), 10 per cent. of terpene, $C_{10}H_{16}$ (boiling point 155° C.), and 30 per cent. of carvol.

FIG. 221.



Anethum.—Fruit, 3 diam.; transverse section, 5 diam.

Properties.—Carminative, stimulant, stomachic. *Dose,* 0.5 to 2 grams (gr. viij–xxx), in powder, infusion, or volatile oil.

CAROTA.—Carrot Fruit.

Origin.—Daúcus Caróta, *Linné. Natural order,* Umbelliferæ, Caucalineæ.

Habitat.—Northern Asia and Europe; naturalized in North America; cultivated.

Description.—About 4 millimeters ($\frac{1}{6}$ inch) long, oval, dorsally compressed, gray-brown, each mericarp with six thin oil-tubes and with nine ribs, of which five are hairy and four beset with long spiny bristles; odor slightly aromatic; taste pungent.

The fruit is collected from wild plants.

Constituents.—Trace of volatile oil, fixed oil. The volatile oil consists of $C_{10}H_{16}$ and $C_{10}H_{18}O$, the latter probably identical with cineol.

Properties.—Stimulant, diuretic. *Dose,* 1 to 2 grams (gr. xv–xxx), in infusion.

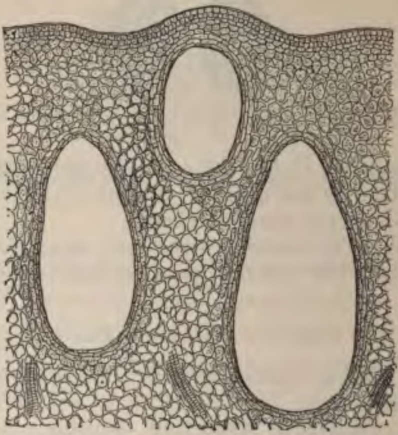
AURANTII CORTEX.—Orange Peel.

Origin.—1. Cítrus vulgáris, *Risso,* bitter orange. 2. Cítrus Aurántium, *Risso,* sweet orange. *Natural order,* Rutaceæ, Aurantieæ.

Habitat.—Northern India; cultivated in subtropical countries.

Description.—Narrow thin bands, the epidermis glandular and dark brownish-green (Aurantii amari cortex), or orange-yellow (Aurantii dulcis cortex), and with very little of the spongy white inner layer adhering to it; odor fragrant; taste aromatic and bitter, or, in the sweet orange peel, faintly bitter. In commerce frequently met with in curved elliptical sections, about 75 millimeters (3 inches) long, with a rather thick layer of the white zest. The epicarp consists under the epidermal layer of parenchyme containing numerous large oil-cells and distant delicate vascular bundles.

FIG. 222.



Orange peel.—Transverse section, magnified 65 diam.

Constituents.—Volatile oil, hesperidin (see Aurantii fructus; in the white zest a principle giving a black color with ferric salts; ash 4–5 per cent. Oil of bitter orange peel (essence de Bigarade) and oil of sweet orange peel (essence de Portugal) consist mainly of hesperidene, $C_{10}H_{16}$, with a small portion of geranial, $C_{10}H_{16}O$, having a strong orange odor, and boiling at 225° C. (437° F.).

Properties.—Stimulant, tonic. *Dose*, 1 to 2 grams (gr. xv–xxx), in infusion or tincture. The volatile oil used for flavoring and in perfumes.

LIMONIS CORTEX.—Lemon Peel.

Origin. — Cítrus Limónum, *Risso*. *Natural Order*, Rutaceæ, Aurantieæ.

Habitat. — Northern India; cultivated in subtropical countries.

Description.—Narrow thin bands, the epidermis deep lemon-yellow and ruggedly glandular, and with very little of the spongy white inner layer adhering to it; odor fragrant; taste aromatic bitterish. In commerce frequently met with in curved elliptical sections with a rather thick layer of white zest.

Constituents.—Volatile oil, hesperidin, principle reacting black with ferric salts, ash 4 per cent. Oil of lemon is pale yellow, of spec. grav. 0.87, and consists mainly of several hydrocarbons, $C_{10}H_{16}$, with a little cymene, $C_{10}H_{14}$, a compound ether, and citral, $C_{10}H_{16}O$, boiling at 228° C., and chemically identical with geranial.

Properties.—Stimulant; used for its flavor.

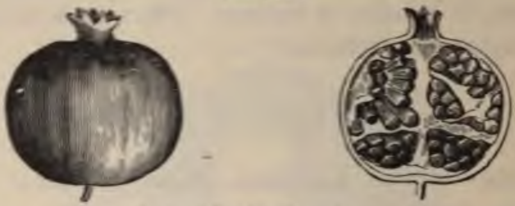
GRANATI FRUCTUS CORTEX.—Pomegranate Rind.

Origin.—Púnica Granátum *Linné*. *Natural order*, Lythrarieæ, Lythreæ.

Habitat.—India and Southwestern Asia; cultivated and naturalized in subtropical countries.

Description.—In irregular curved brittle fragments, 1 or 2 millimeters ($\frac{1}{25}$ to $\frac{1}{12}$ inch) thick, some of them with the tubular six- to nine-toothed calyx attached; externally roughish-tubercular and reddish-brown; inner surface lighter colored, marked with depressions; fracture granular; inodorous; taste astringent.

FIG. 223.



Fruit of Punica Granatum.

Constituents.—Tannin 28 per cent., gum, little sugar, ash 6 per cent.

Properties.—Astringent, anthelmintic. *Dose,* 1 to 2 grams (gr. xv–xxx), in powder or decoction.

TAMARINDUS.—TAMARIND.

Pulpa tamarindorum.

Origin.—Tamaríndus índica, *Linné,* s. T. officinális, *Hooker. Natural order,* Leguminosæ, Cæsalpinieæ, Amherstieæ.

Habitat.—India and tropical Africa; naturalized in the West Indies.

Description.—The indehiscent legume is flattish, from 5 to 15 centimeters (2–6 inches) long, and about 25 millimeters (1 inch) broad; the gray-brown pericarp having a corky texture is removed, and the remainder constitutes commercial tamarind. A reddish-brown, sweet, acidulous, pulpy, rather tough mass, containing strong somewhat branching fibres, and polished brown flattish subquadrangular seeds, each inclosed in a tough membrane.

Varieties.—West Indian tamarinds; described above; the inner part of the fruit is mixed with syrup.

East Indian tamarinds; usually preserved without syrup; tough, dark-colored masses, of a strong acid taste.

Egyptian tamarinds; preserved without sugar, formed into cakes, and dried; hard flattish acid cakes, frequently mouldy.

Constituents.—Tartaric, citric, a little malic, and acetic acids, mostly as potassium compounds; sugar, pectin, tannin, the latter in the testa of the seeds.

Properties.—Refrigerant, laxative. *Dose,* 2 to 20 grains (ʒss–v) or more, in infusion, whey, confection.

11. SEEDS.—SEMINA.

The seed is the fertilized and fully developed ovule, and contains the embryo. It is invested with one or two integuments, the outer one being called testa or spermoderm, and the inner one tegmen or endopleura. In many seeds the tegmen is blended with the testa or coheres with the kernel. The seed stalk, called funiculus or podosperm, is usually absent in the officinal seeds; the scar left by its detachment is the hilum. The continuation of the funiculus along the testa is the raphe, and where it is confluent with the nucleus the chalaza or inner hilum is located. The micropyle, a small depression of the testa, marking the location of the radicle, is in nearly all officinal seeds near the hilum; most of the seeds are anatropous, and have the hilum and chalaza at nearly opposite ends and united by a raphe, while the campylotropous seeds, which are more or less kidney-shaped, have hilum, chalaza, and micropyle close together.

Within the seed-integuments is contained the embryo, consisting of caulicle, plumule, and one or two cotyledons, and either completely filling the seed-coats, in which case the seed is exalbuminous, or it is invested with another tissue, usually horny, oily, or amylaceous, which is called the albumen (endosperm, also perisperm). The kernel of exalbuminous seeds consists chiefly of the cotyledons, the caulicle (radicle), and plumule being usually small; but albuminous seeds have frequently a small embryo, the greater portion of the seed-kernel consisting often of the albumen.

The testa of the different seeds varies greatly, not only in color, but likewise in texture, in external appendages (hairs, epithelia, etc.) and more particularly in the character of the cells and their thickening layers, all of which may afford microscopic characteristics for distinguishing seeds even in the powdered condition. The embryo is in most cases formed of delicate parenchyme cells, among which rudimentary or but partly developed vascular bundles are found; these cell-elements, therefore, offer few characteristics, except through the nature of their contents. Although the albumen (endosperm) is often made up of cells similar to those of the embryo, their variations in shape, thickness, texture and contents are much greater.

Classification.

Sect. 1. Dicotyledonous seeds.

I. Exalbuminous.

a. Embryo straight.

Angular ovate; testa mucilaginous.	Cydonium.
Flattish ovate; testa membranous, brown, and scurfy; taste bland.	Amygdala dulcis.
taste bitter.	Amyg. amara.
testa coriaceous, black or whitish; seed small.	Sesamum.
testa coriaceous, white.	Melo.
Flat ovate; testa white, grooved near the margin, edge obtuse.	Pepo.
testa white, ungrooved, edge thickish, acute.	Cucumis.
testa marbled or orange-brown, edge obtuse.	Citrullus.

Oblong; testa blackish, fragile; fragrant.	Dipterix.
Ovate-oblong, testa brown, fragile; cotyledons crumbling when cut.	Theobroma.
testa reddish-brown; cotyledons dark colored, differing in size.	Cola.
b. Embryo curved.	
Reniform-oblong, with a long furrow on the convex side.	Physostigma.
Rhomboid, with a diagonal furrow.	Fœnum græcum.
Subglobular; scarlet red with a black spot.	Abrus.
Globular; testa yellowish, finely pitted.	Sinapis alba.
testa blackish-brown, finely reticulate.	Sinapis nigra.
testa blue-black, finely pitted, larger.	Rapa.
II. Albuminous.	
a. Embryo straight.	
Orbicular, horny.	Nux vomica.
Oblong, angular.	Ignatia.
Tetrahedral; testa black, pitted.	Delphinium.
testa gray-brown, pitted.	Staphisagria.
Triangular-ovate, black, fragrant when rubbed.	Nigella.
Flattish-ovate; testa brown, mucilaginous.	Linum.
Oblong-lanceolate, silky, gray-green.	Strophanthus.
Globular-ovate; testa removed; albumen marbled.	Myristica.
Ovate-oblong; testa dull brownish-gray; kernel brown, oily.	Gynocardia.
Oval-oblong; testa glossy, grayish, variegated with red-brown.	Ricinus.
surface dull gray-brown mottled with black.	Tiglium.
testa dull black, with fine fissures.	Curcas.
b. Embryo curved.	
Elliptic plano-convex, grooved on the flat side.	Caffea.
Reniform; testa black, reticulate, and pitted.	Stromonium.
testa gray-brown, finely pitted.	Hyoscyamus.
testa blackish, bluish, or whitish, with shallow pits.	Papaver.
Sect. 2. Monocotyledonous seeds; all albuminous.	
Linear-oblong; blackish-brown.	Sabadilla.
Subspherical; testa granular; albumen horny.	Colchicum.

Roundish-angular, spicy; hilum depressed.	Granum paradisi.
hilum tufted.	Melegueta.
Roundish-conical, veined externally and internally.	Areca.

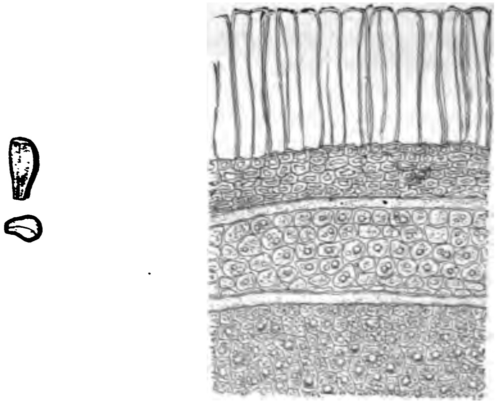
CYDONIUM.—Quince Seed.

Origin.—Py′rus Cydónia, *Linné* (Cydónia vulgáris, *Persoon*). *Natural order*, Rosaceæ, Pomeæ.

Habitat.—Western Asia; cultivated.

Description.—About 6 millimeters (¼ inch) long, ovate or ovate-oblong, triangularly compressed; hilum near the pointed end; chalaza at the blunt end; testa brown, covered with a whitish mucilaginous epithelium, causing the seeds of each cell to adhere together, and, on immersion in water, forming a gelatinous zone; taste of the unbroken seed insipid; embryo white, oily, and of a bitter-almond taste; cotyledons thick, plano-convex.

Fig. 224.



Quince seed.—Natural size and section. Section through epithelium, testa, and tegmen, into a cotyledon; magnified 150 diam.

Constituents.—Mucilage 20 per cent., not precipitated by borax; fixed oil, proteids, ash 3.5 per cent.

Properties.—The unbroken seeds are demulcent and protective. A thick mucilage is yielded from 1 part of seeds to 50 parts of water.

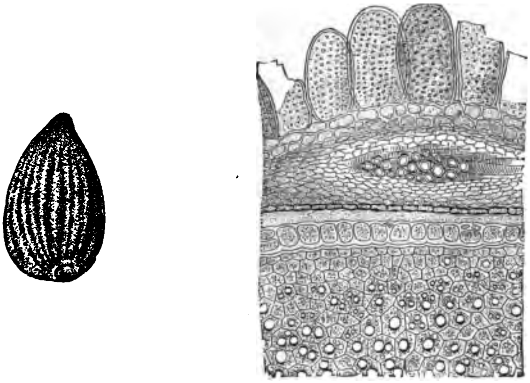
AMYGDALA.—ALMOND.

Origin.—Prúnus Amy′gdalus, *Baillon* (Amy′gdalus commúnis, *Linné*, var. α amára, β dúlcis, *De Candolle*). *Natural order*, Rosaceæ, Pruneæ.

Habitat.—Western Asia; naturalized in the Mediterranean basin; cultivated.

Description.—Flattish ovate or ovate-lanceolate, 20 to 25 millimeters ($\frac{4}{5}$ to 1 inch) long; testa brown, scurfy, with about 16 longitudinal veins; hilum near the pointed end; chalaza broad at the rounded end; embryo white, oily, consisting of two ovate-lanceolate plano-convex cotyledons and a short projecting conical radicle; inodorous.

FIG. 225.



Almond.—Seed. Section through seed coats and portion of the cotyledon.

Amygdala dulcis. Mostly large, and sides rather convex; taste bland.

Amygdala amara. Mostly smaller and flattish; taste bitter; the emulsion with water has an odor resembling that of hydrocyanic acid.

Constituents.—Fixed oil, 45 (in bitter almonds) to 56 per cent. (in sweet almonds), mucilage 3 per cent., sugar 6 per cent., proteids precipitated by acetic acid (myosin, vitellin, and conglutin) 25 per cent., ash about 3 per cent., and in the testa tannin; the unformed ferment (enzyme) of almonds is emulsin or synaptase, which is coagulated by heat, and is precipitated by alcohol, but not precipitated by acetic acid. Bitter almonds contain, in addition to these compounds, 1 to 3 per cent. of amygdalin, $C_{20}H_{27}NO_{11}$, which crystallizes in prisms, is soluble in water, less freely in alcohol, insoluble in ether, is slightly bitter, and splits into glucose, hydrocyanic acid (1 part from 17 parts amygdalin), and benzaldehyd, C_7H_6O, or oil of bitter almond. The latter (yield about 1 per cent., or after the expression of the fat, about 2 per cent. of the seed) in the crude state has the spec. grav. 1.06–1.075; when freed from hydrocyanic acid it is 1.049. It is sometimes adulterated with nitrobenzol.

Properties.—Demulcent, used in emulsion; the bitter almond sedative. *Dose* of the volatile oil $\frac{1}{4}$ to 1 drop; poisonous in overdoses. Treatment of poisoning necessitates rapid evacuation; then stimulants and douches.

SESAMUM.—Benne Seed.

Origin—Sésamum orientále and S. índicum, *Linné. Natural order*, Pedalineæ, Sesameæ.

Habitat.—Southern Asia; cultivated in tropical and subtropical countries.

Description.—Flattish ovate, 3 to 4 millimeters ($\frac{1}{8}$ to $\frac{1}{6}$ inch) long, 2 millimeters ($\frac{1}{12}$ inch) broad, and 1 millimeter ($\frac{1}{25}$ inch) thick; testa black or purplish-brown (S. orientale), pale brown, yellowish or whitish (S. indicum), finely punctate, with four delicate longitudinal ridges; hilum near the pointed end, somewhat prominent; tegmen (endosperm?) thin, white, oily; cotyledons plano-convex, white and oily; inodorous; taste bland.

Constituents.—Fixed oil 50–56 per cent., proteids 22 per cent., mucilage 4 per cent., ash 6–8 per cent.

Properties.—Laxative; mostly used for preparing benne seed oil.

MELO.—MELON SEED.

Origin.—Cúcumis Mélo, *Linné. Natural order,* Cucurbitaceæ, Cucumerineæ.

Habitat.—Central Asia; cultivated.

Description.—Flattish ovate or lance-ovate, 10 to 13 millimeters (⅖–½ inch) long; testa white or whitish, smooth, the edge rather blunt; hilum near the pointed end; cotyledons plano-convex, white, and oily; inodorous; taste bland.

Constituents.—Fixed oil, proteids.

Properties.—Anthelmintic. *Dose,* 30 to 65 grams (℥j–ij), in emulsion.

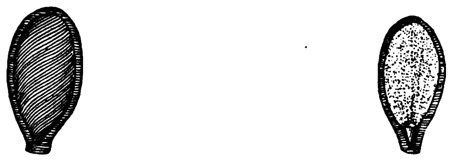
PEPO.—PUMPKIN SEED.

Origin.—Cucúrbita Pépo, *Linné. Natural order,* Cucurbitaceæ, Cucumerineæ.

Habitat.—Tropical Asia and America; cultivated.

Description.—Flat, broadly ovate, about 2 centimeters (⅘ inch) long; testa white or whitish with a shallow groove and flat ridge parallel to the margin; hilum near the pointed end; cotyledons flat, white, and oily; radicle short, conical; inodorous; taste bland.

FIG. 226.



Pepo.—Seed and cotyledon with radicle and plumule.

Constituents.—Fixed oil 44 per cent., proteids (myosin and vitellin), starch, acrid resin, sugar, ash 3 or 4 per cent. The infusion of the seeds on being saturated with NaCl, precipitates myosin, and on the further addition of CO_2, separates vitellin of same behavior as vitellin of yolk of egg.

Properties.—Tænifuge. *Dose,* 30 to 65 grams (℥j–ij), in powder or emulsion.

CUCUMIS.—Cucumber Seed.

Origin.—Cúcumis satívus, *Linné.* *Natural order,* Cucurbitaceæ, Cucumerineæ.

Habitat.—Central Asia; cultivated.

Description.—Flat and thin, 8 to 12 millimeters (⅓–½ inch) long, lance-oblong, ungrooved, acutely edged, dingy white; otherwise resembling pumpkin seed.

Constituents.—Fixed oils, proteids, etc.

Properties.—Diuretic, anthelmintic. *Dose,* 8 to 65 grams (ʒij–℥ij).

CITRULLUS.—Watermelon Seed.

Origin.—Cúcumis (Cucúrbita, *Linné*) Citrúllus, *Séringe,* s. Citrúllus vulgáris, *Schrader.* *Natural order,* Cucurbitaceæ, Cucumerineæ.

Habitat.—Southern Asia; cultivated.

Description.—Flat, ovate, 10 to 15 millimeters (⅖–⅗ inch) long; testa blackish and marbled, or orange-brown, ungrooved, blunt on the edge; otherwise resembling pumpkin seed.

Constituents.—Fixed oil 30 per cent., and proteids.

Properties.—Diuretic, anthelmintic. *Dose,* 8 to 65 grams (ʒij–℥ij).

DIPTERYX.—Tonco. Tonka Bean.

Origin.—1. Dípteryx (Coumaroúna, *Aublet*) odoráta, *Willdenow;* 2. D. oppositifólia, *Willdenow.* *Natural order,* Leguminosæ, Papilionaceæ, Dalbergieæ.

Habitat.—Guiana.

Description.—Oblong, somewhat compressed, 4 to 5 centimeters (1½ to 2 inches) long, about 1 centimeter (⅖ inch) broad; hilum near the thin end; testa blackish, fragile, thin, somewhat glossy, veined and wrinkled; embryo pale brown, oily; radicle short and thick; cotyledons plano convex, inclosing a rather large pinnate plumule and acicular crystals; fragrant; taste aromatic bitter.

Varieties.—Dutch Tonka. About 5 centimeters (2 inches) long, frequently covered with a crystalline inflorescence.

English Tonka. About 4 centimeters (1½ inch) long; its surface with little or no efflorescence.

Constituents.—Fixed oil about 25 per cent., coumarin, $C_9H_6O_2$, sugar, mucilage, ash 3.5 per cent. Coumarin is in glossy aromatic prisms, is freely soluble in alcohol and fats, sparingly soluble in cold water, and melts at 67° C. (152.6° F.).

Properties.—Stimulant; used only for its flavor.

THEOBROMA.—CACAO.

Origin.—Theobróma Cacáo, *Linné.* *Natural order,* Sterculiaceæ, Buettnerieæ.

Habitat.—Tropical America; cultivated.

Description.—The seeds are either dried when removed from the fruit, or are previously fermented in the sweating-box or buried in the ground (claying), until the astringency disappears. Ovate or ovate-oblong, somewhat flattened, obtuse, 15 to 25 millimeters (⅗ to 1 inch) long; testa reddish-brown to brown-gray, thin, fragile, with numerous longitudinal veins; hilum at the broad end; chalaza at the narrow end; embryo red-brown, oily; radicle short; cotyledons ribbed upon the face, irregularly lobed from the back through the folds of the tegmen, and readily breaking into angular fragments; taste oily, aromatic and bitterish. Unsweated cacao has a more bitter and astringent taste. 100 parts of cacao yield about 12 parts of shells and 88 parts of kernels.

Constituents.—Fat about 50 per cent., starch 16 per cent., proteids 18 per cent., ash 3.5–4.5 per cent., sugar 0.6 per cent.; coloring matter, a little caffeine, and 1.5 to 4.5

per cent. (somewhat less in the testa) of theobromine (dimethylxanthine) $C_7H_8N_4O_2$, which is white, crystalline, bitter, not altered by potassa solution, slightly soluble in cold water, alcohol, and ether, and may be converted into caffeine by treating theobromine-silver with methyl-iodide.

Properties.—Nutritive, stimulant; used for preparing chocolate.

COLA.—COLA.

Origin.—Cóla (Sterculia, *Beauvais*) acumináta, *R. Brown*. *Natural order*, Sterculiaceæ, Sterculieæ.

Habitat.—Tropical Western Africa

Description.—Oblong-ovate, about 25 millimeters (1 inch) long, somewhat flattened; testa brown or reddish-brown, often with blackish spots, brittle; embryo usually dark-colored, when freshly cut yellow or whitish, the cotyledons differing in size, thick, variously bent; odor faintly nutmeg-like; taste somewhat aromatic.

Constituents.—Caffeine 2 per cent., little theobromine, starch 42 per cent., sugar, gum, proteids, little volatile oil, fat and tannin; ash 3 per cent.

Properties.—Tonic, stimulant, nervine; used also roasted like coffee.

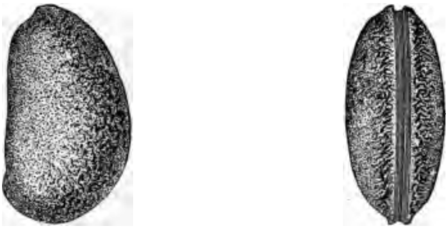
PHYSOSTIGMA.—CALABAR BEAN.

Origin.—Physostígma venenósum, *Balfour*. *Natural order*, Leguminosæ, Papilionaceæ, Phaseoleæ.

Habitat.—Tropical Western Africa, near the mouth of the Niger and old Calabar.

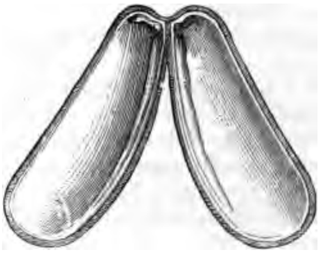
Description.—Oblong and somewhat reniform, 25 to 30 millimeters (1–1$\frac{1}{5}$ inches) long, 15 to 20 millimeters ($\frac{3}{5}$–$\frac{4}{5}$ inch) broad, and 12 millimeters ($\frac{1}{2}$ inch) thick; testa granular, chocolate brown; hilum in a broad black groove extending over the entire length of the convex edge, bordered on each side by a reddish-brown ridge, marked along the centre by the linear raphe, and having at one end the micropyle, at the other end the chalaza; embryo with a short curved radicle and two large white concavo-convex cotyledons, which adhere with the back to the integuments, and between their faces enclose an elliptic cavity; inodorous, taste bean-like. The integuments weigh about 28, and the embryo 72 per cent.

FIG. 227.



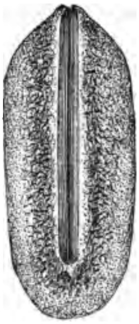
Physostigma.—View from the side and edge, showing length of hilum.

FIG. 228.



Physostigma split, showing cotyledons.

FIG. 229.



Physostigma cylindrospermum.

On moistening the embryo with solution of potassa it acquires a pale yellow color.

The seed of Physostígma (Mucúna, *Oliver*) cylindrospérmum, *Holmes*, is 4 centimeters (1$\frac{3}{5}$ inches) long, nearly cylindrical, has a shorter groove and hilum, otherwise closely resembles the preceding.

Constituents.—Physostigmine or eserine, $C_{15}H_{21}N_3O_2$ (in the embryo; amorphous, tasteless, soluble in alcohol, ether, chloroform, benzol, carbon disulphide, less freely in water, reddened by alkalies and by chlorinated lime), calabarine (derivative of physostigmine; tetanic; insoluble in ether), eseridine (causes diarrhœa; by warm dilute acids converted into physostigmine), physosterin (indifferent, crystalline), starch 48 per cent., proteids 23 per cent., mucilage, ash 3 per cent.

Properties.—Sedative, poisonous; contracts the pupil. *Dose*, 0.06 to 0.26 gram (gr. j–iv), in powder, tincture, or extract; eserine, 0.001 to 0.005 gram (gr. $\frac{1}{64}$ to $\frac{1}{12}$).

Antidotes.—Evacuation (stomach-pump, emetics); atropine; chloral; strychnine; stimulants.

FŒNUM GRÆCUM.—FENUGREEK.

Origin.—Trigonélla Fœ'num græ'cum, *Linné*. *Natural order*, Leguminosæ, Papilionaceæ, Trifolieæ.

Habitat.—India, naturalized in the Mediterranean basin; cultivated.

Description.—Rhomboid, about 3 millimeters ($\frac{1}{8}$ inch) long, and 2.5 millimeters ($\frac{1}{10}$ inch) broad, compressed, four-edged; from the hilum on one edge, diagonally furrowed on both sides; testa brownish or yellowish, finely granular, hard; tegmen (endosperm?) colorless, horny; embryo light yellow, oily, the radicle curved upon the edge of the cotyledons; odor peculiar; taste mucilaginous, bitter.

Constituents.—Mucilage 28 per cent. (chiefly in the inner seed coat), fat 6 per cent., volatile oil a trace, trigonelline (crystalline, soluble in water, not poisonous; yields nicotic acid), choline (probably from decomposition of lecithin), proteids 22 per cent., bitter principle, ash about 4 per cent., free from starch.

Adulteration.—Powdered fenugreek is sometimes adulterated with ground amylaceous seeds.

Properties.—Demulcent, discutient; used in veterinary practice.

ABRI SEMEN.—PRAYER BEADS, JEQUIRITI.

Origin.—A'brus precatórius, *Linné.* *Natural order,* Leguminosæ, Papilionaceæ, Vicieæ.

Habitat.—India, naturalized in other tropical countries.

Description.—Subspherical or globular-ovate, 5 to 8 millimeters ($\frac{1}{5}$–$\frac{1}{3}$ inch) long, scarlet-red, with a black spot at the hilum; testa hard; cotyledons plano-convex; radicle short, curved; inodorous; taste bean-like.

Constituents.—Abric acid (crystalline, soluble in alcohol sparingly soluble in water), fixed oil, lecithin or protagon (yields phosphoric acid, glycerin, etc.), alkaloid (probably decomposition product), ash about 3 per cent. The irritating principles are two proteids rendered inactive by moist heat, a paraglobulin (soluble in 15 per cent. NaCl solution, coagulated near 80° C.) and an albumose (not coagulated by heat, but precipitated by HNO_3, this redissolved on heating, and reprecipitated on cooling).

Properties.—Irritating to the eyes; infusion used in granular ophthalmia.

SINAPIS ALBA.—WHITE MUSTARD.

Origin.—Brássica (Sinápis, *Linné*) álba, *Hooker filius.* *Natural order,* Cruciferæ, Brassiceæ.

Habitat.—Asia and Southern Europe; cultivated.

Description.—Almost globular, nearly 2 millimeters ($\frac{1}{12}$ inch) in diameter; hilum circular; testa yellowish, finely pitted, hard; embryo greenish yellow, oily, with a curved radicle and two cotyledons, one folded over the other; inodorous; taste pungent and acrid.

Constituents.—Fixed oil (20–25 per cent., bland), lecithin (small quantity), mucilage (mainly in the testa), myrosin and other proteids, sinalbin, sinapine sulphocyanide, ash 4.5 per cent.; free from starch. Sinalbin, $C_{30}H_{44}N_2S_2O_{16}$, forms colorless prisms, is soluble in water, sparingly soluble in cold alcohol; insoluble in ether and carbon disulphide, colored yellow by alkali, blood-red by HNO_3, and splits into sugar, sinapine sulphate, $C_{16}H_{23}NO_5H_2SO_4$, and acrinyl sulphocyanide, $C_7H_7O.NCS$; the latter is a yellow acrid non-volatile oil, readily soluble in alcohol and ether. Sinapine sulphocyanide forms colorless bitter prisms, soluble in water and alcohol. On boiling with alkalies sinapine yields choline (bilineurine) or sinkaline, $C_5H_{15}NO_2$, and sinapic acid, $C_{11}H_{12}O_5$.

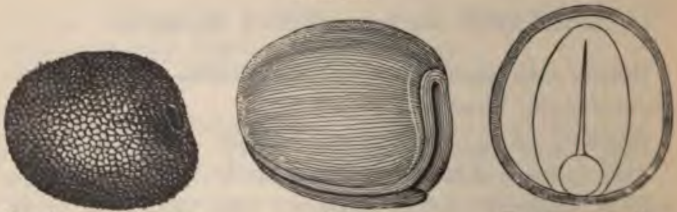
Properties.—Tonic, laxative, diuretic, stimulant, emetic; externally rubefacient and epispastic. *Dose*, 1 to 4 grams (gr. xv–ʒj), entire, in powder, or infusion; externally as poultice.

SINAPIS NIGRA.—Black Mustard.

Origin.—Brássica (Sinápis, *Linné*) nígra, *Koch*. *Natural order*, Cruciferæ, Brassiceæ.

Habitat.—Asia and Southern Europe; cultivated.

Fig. 230.



Sinapis.—Entire, magnified. Embryo. Transverse section.

Description.—Almost globular, about 1 millimeter ($\frac{1}{25}$ inch) in diameter, with a circular hilum; testa blackish-brown, finely reticulate, hard; embryo greenish-yellow, oily, with a curved radicle and two cotyledons, one folded over the other; inodorous when dry, but when moist of a pungent, penetrating, irritating odor; taste pungently acrid.

Constituents.—Fixed oil 25 per cent. (bland), mucilage (mainly in the testa), lecithin (minute quantity), myrosin and other proteids, sinigrin or potassium myronate about 0.5 per cent., sinapine sulphocyanide, ash 4 per cent., no starch. Sinigrin, $KC_{10}H_{18}NS_2O_{10}$, forms silky white needles, is soluble in water, slightly soluble in absolute alcohol, insoluble in ether, chloroform, and benzol; splits into sugar, acid potassium sulphate, and allyl sulphocyanide or volatile oil of mustard, C_3H_5CNS; the latter is very pungent and acrid, has the density 1.018, dissolves in sulphuric acid without coloration, and contains also variable quantities of CS_2. Myrosin coagulates at 60° C. (140° F.).

Properties and Dose similar to Sinapis alba.

Allied Seeds.—Turnip seeds, from Bråssica Råpa, *Linné.* Larger than the preceding, 1.5–2 millimeters ($\frac{1}{16}$–$\frac{1}{12}$ inch) thick, brown or nearly black, finely pitted; slightly acrid.

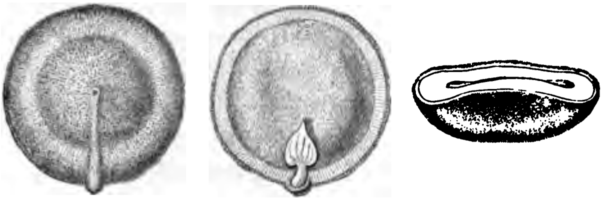
Rape seed, Cole or Colza seed, from Bråssica Nåpus, *Linné.* Larger than turnip seed, 2–2.5 millimeters ($\frac{1}{12}$–$\frac{1}{10}$ inch) thick, finely pitted, mostly blue-black, slightly acrid.

NUX VOMICA.—Nux Vomica.

Origin.—Stry′chnos Nux vómica, *Linné. Natural order,* Loganiaceæ, Euloganieæ.

Habitat.—India and East India Islands.

Fig. 231.

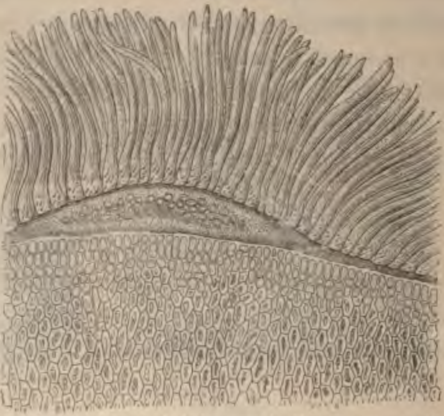


Nux vomica.—Whole seed; cut longitudinally; cut transversely.

Description.—Orbicular, about 25 millimeters (1 inch) in diameter, grayish or greenish-gray; soft-hairy, of a silky lustre, with a slight ridge extending from hilum in the centre of one side to the edge, where the radicle is located; testa thin, tough, and closely blended with the albumen, which is horny, yellowish or whitish, somewhat translucent, very tough, and has a large circular cavity, into which the heart-shaped nerved cotyledons project; inodorous, persistently bitter.

Constituents.—Alkaloids (total amount 2.5–4.0 or 5.3 per cent.), strychnine, brucine, and igasurine (probably impure brucine), combined with igasuric acid (amorphous, dark green by ferric salts); loganin, proteids 11 per cent., fat, gum, sugar 6 per cent., ash 1–1.5 per cent. Strychnine constitutes from 33 to 50 per cent. of the total alkaloids.

FIG. 232.



Nux vomica.—Section through hilum and albumen, magnified 60 diam.

Strychnine, $C_{21}H_{22}N_2O_2$, is in four sided prisms, very bitter, insoluble in absolute ether, soluble in 5 parts of chloroform, 110 parts of cold 90 per cent. alcohol, 1600 parts of benzol, 7000 parts of cold water; melting point 268° C. Sulphuric acid with potassium bichromate colors deep violet or blue; similar color by sulphuric acid and lead peroxide or potassium ferricyanide, changing to red and yellow; heated with strong nitric acid yields picric acid; but diluted nitric acid does not affect the alkaloid (Gerock, 1889). The salts are very bitter. Commercial strychnine contains some homostrychnine, $C_{22}H_{24}N_2O_2$ (Koefoed, 1889). Strychnine oxidized with permanganate yields amorphous strychnic acid, $C_{11}H_{11}NO_3$. Boiled with soda in absolute alcohol strychnine is converted into strychnol (also called strychnic acid), $C_{21}H_{24}N_2O_3$, which is readily soluble in alkalies, does not give the strychnine reaction with chromic acid, is colored red by mixture of nitric and sulphuric acids, and is reconverted by heating at 190° C. in a current of hydrogen.

Brucine, $C_{23}H_{26}N_2O_4$, is in rectangular octahedra, containing $4H_2O$, is readily soluble in alcohol and in 7 parts of chloroform, insoluble in pure ether, melting point (of anhydrous) 178° C.; nitric acid colors blood-red, changing to orange and yellow, and the yellow liquid becomes violet on the addition of stannous chloride, or sulphide of ammonium or sodium; even nitric acid of 1.06 spec. grav. decomposes brucine on heating (Gerock, 1889). The salts are very bitter.

Loganin, $C_{25}H_{34}O_{14}$, forms colorless prisms, is easily soluble in alcohol and water, turns red and purple with sulphuric acid, and splits into sugar and loganetin.

Properties.—Tonic, spinal nervine, poisonous. *Dose,* 0.03 to 0.3 gram (gr. ss–v), in tincture or extract. Strychnine, 0.001 to 0.01 gram (gr. $\frac{1}{64}$–$\frac{1}{6}$).

Antidotes.—Evacuants (stomach pump, emetics, purgatives); tannin, or animal charcoal; chloroform inhalation; chloral hydrate. Also potassium bromide, curare, cannabis indica, amyl nitrite, etc., have been recommended.

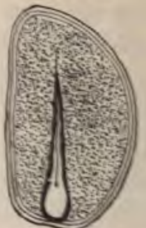
IGNATIA.—BEAN OF ST. IGNATIUS.

Origin.—Stry′chnos Ignátia, *Lindley*, s. Ignatiána philippínica, *Loureiro.* *Natural order*, Loganiaceæ, Euloganieæ.

Habitat.—Philippine Islands.

Description.—Oblong or ovate, irregularly angular, about 3 centimeters ($1\frac{1}{5}$ inches) long, dull brownish or blackish, very hard, horny; hilum at one end; fracture granular irregular; the albumen brownish, somewhat translucent, inclosing an irregular cavity with an oblong embryo; inodorous, very bitter.

FIG. 233.



Ignatia.—Vertical section.

Constituents.—Strychnine 0.5 to 1.5 per cent., brucine 0.5 to 1.4 per cent., proteids 10 per cent., fat, gum, ash 2.5 per cent.

Properties.—Like nux vomica. *Dose*, 0.03 to 0.2 gram (gr. ss–iij).

Antidotes.—Same as for nux vomica.

DELPHINIUM.—LARKSPUR SEED.

Origin.—Delphínium Consólida, *Linné.* *Natural order*, Ranunculaceæ, Helleboreæ.

Habitat.—Central Europe; cultivated.

Description.—Flattish tetrahedral, 1 to 1.5 millimeters ($\frac{1}{25}$ to $\frac{1}{16}$ inch) broad, acute on the edges; testa black, roughly pitted; albumen whitish, oily, inclosing a small straight embryo; inodorous, taste bitter and acrid.

Constituents.—Fixed oil, probably also delphinine.

Properties.—Diuretic, cathartic, emetic, poisonous; externally rubefacient; rarely employed.

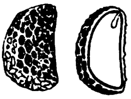
STAPHISAGRIA.—STAVESACRE.

Origin.—Delphínium Staphiságria, *Linné.* *Natural order*, Ranunculaceæ, Helleboreæ.

Habitat.—Basin of the Mediterranean; cultivated.

Description.—Flattish tetrahedral, about 5 millimeters (1/5 inch) long and 3 or 4 millimeters (1/8 to 1/6 inch) broad, the broadest side convex, testa brown or brown-gray, with reticulate ridges; albumen whitish, oily, inclosing a small straight embryo; nearly inodorous; taste bitter and biting.

FIG. 234.



Stavesacre seed and section; magnified 2 diam.

Constituents.—Delphinine (white, crystalline, acrid), delphinoidine (amorphous), delphisine (crystalline); the three alkaloids soluble in alcohol, ether, and chloroform, the last two becoming brown by sulphuric acid; staphisain (yellow, insoluble in ether, acrid, red and violet by sulphuric acid), fixed oil 25 per cent., trace of volatile oil, proteids, mucilage; ash 9 per cent.

Properties.—Diuretic, cathartic, emetic, poisonous; externally rubefacient; mostly used for killing vermin.

NIGELLA.—NIGELLA.

Origin.—1. Nigélla damascéna, *Linné.* 2. N. satíva, *Linné.* *Natural order*, Ranunculaceæ, Helleboreæ.

Habitat.—Levant and Southern Europe; cultivated.

Description.—1. Triangular-ovate, 2.5 millimeters ($\frac{1}{10}$ inch) long, finely pitted, dull black; testa brittle; albumen oily; embryo straight, small, in the pointed end; odor on rubbing strawberry-like; taste bitter, somewhat acrid; imparts fluorescence to petroleum benzin. No. 2. Similar, but netted-wrinkled, rounded at the edges, odor on rubbing cajuput-like; benzin not rendered fluorescent.

Constituents.—Fixed oil, volatile oil (odor different from that of the seeds); in No. 1 damascenine (melting point 27° C., fluorescent; solutions of the salts not fluorescent); in No. 2 melanthin (acrid glucoside, soluble in alcohol, red or violet by H_2SO_4); ash 4 per cent.

Properties.—Emmenagogue, diuretic, expectorant; rarely used.

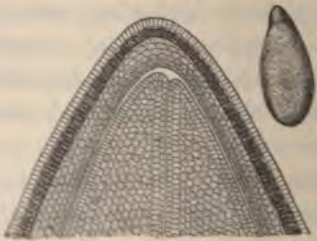
LINUM.—Flaxseed.

Origin.—Línum usitatíssimum, *Linné.* *Natural order,* Lineæ, Eulineæ.

Habitat.—Levant and Southern Europe; cultivated and spontaneous in most temperate countries.

Description.—Flattish ovate or oblong ovate, about 5 millimeters ($\frac{1}{5}$ inch) long, obliquely pointed at one end; testa brown, glossy, very finely pitted, covered with a transparent mucilaginous epithelium, which swells considerably in water; hilum near the pointed end; embryo whitish, oily; cotyledons large, plano-convex, covered with a thin albumen; inodorous, mucilaginous, oily, and bitter.

Fig. 235.



Flaxseed.—Entire; magnified 3 diam. Transverse section near the edge, magnified 65 diam.

Constituents.—Fixed oil 30–35 per cent. (in the nucleus), mucilage 15 per cent. (in the epithelium), proteids 25 per cent., amygdalin (minute quantity), resin, wax, sugar, ash 3–4 per cent. After expressing the oil, cake meal yields 5 to 6 or 8 per cent. of ash. Starch is absent.

Properties.—Demulcent. *Dose*, 4 to 10 grams (ʒj–ijss) or more, in infusion; externally as poultice.

STROPHANTHUS.—STROPHANTHUS.

Origin.—Strophánthus Kombé, *Oliver*, now regarded by Oliver as a variety of Str. híspidus, *De Candolle.* *Natural order*, Apocynaceæ, Echiteæ.

Habitat.—Tropical Africa.

Description.—Oblong-lanceolate, 15 to 20 millimeters (3/5–4/5 inch) long, and 4 or 5 millimeters (1/6–1/5 inch) broad, narrowed, but blunt at the base, flattened on the sides and obtusely two-edged, grayish-green, covered with appressed silky hairs, one side with a longitudinal ridge prolonged through the attenuated, pointed apex into a brittle awn, which is 7 to 10 centimeters (3 to 4 inches) long, bare in the lower half, and above on all sides beset with delicate, straight, white silky hairs, about 5 centimeters (2 inches) in length; kernel white, oily, consisting of a straight embryo with two thin cotyledons and surrounded by a thin layer of endosperm; inodorous, taste very bitter.

The seeds are met in the market deprived of the awns; but are sometimes imported in the follicles, which are 20 to 30 centimeters (8–12 inches) long, linear-oblong and pointed; for medicinal purposes the awns and pericarps are to be removed, the seed alone being used.

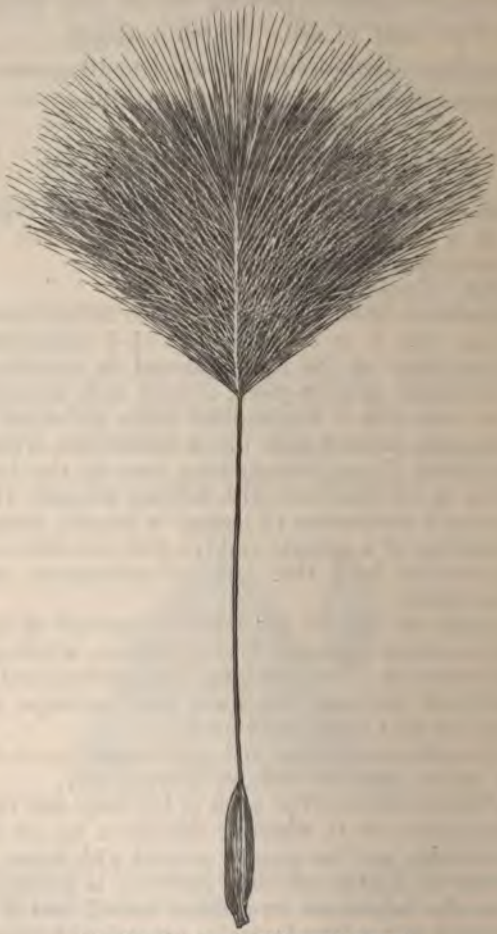
The decoction is brownish and not changed in color by solutions of iodine, ferric chloride, or Mayer's test.

False Kombé Seeds.—The seeds of Str. híspidus, *De C.*, and Str. dichótomus, *De C.*, resemble the above, but are brown or chestnut-brown, and less densely covered with hairs.

The seed of Kícksia africána, *Bentham*, is pointed at both ends, has the cotyledons irregularly folded, and is awnless, but provided with a long funiculus covered with long hairs.

Constituents.—Kombic acid (precipitated by lead acetate) and strophantin, $C_{31}H_{48}O_{12}$. The latter is imperfectly crystalline, neutral, very bitter, soluble in water and alcohol, nearly insoluble in ether, benzol, and chloroform, precipitated by tannin, colored green and brown by H_2SO_4, and blue by H_2SO_4 and $K_2Cr_2O_7$, and is by most acids easily split into glucose and crystals of strophanthidin.

FIG. 236.



Strophanthus seed with comose awn.

Properties.—Heart sedative. *Dose* of tincture (1:16 alcohol) 4–8 minims.

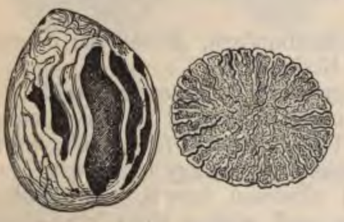
MYRISTICA.—Nutmeg.

Origin.—Myrística frágrans, *Houttuyn* (M. moschâta, *Thunberg*, M. aromática, *Lamarck*, M. officinális, *Linné filius*). *Natural order*, Myristicaceæ.

Habitat.—Molucca Islands; cultivated in tropical countries.

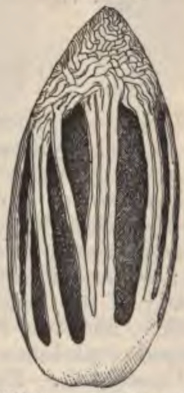
Description.—Roundish-ovate, about 25 millimeters (1 inch) long; deprived of the brittle woody testa, which shows shallow impressions from mace; kernel externally light brown, reticulately furrowed; internally of a fatty lustre, pale brownish with dark brown veins containing the folds of the inner seed-coat; hilum and micropyle on the broad end, chalaza near the upper end, united by a groove corresponding to the raphe; embryo small, in a cavity at the base; strongly aromatic, somewhat bitter.

Fig. 237.



Nutmeg, with mace and transverse section.

Fig. 238.



Wild nutmeg, with mace.

Varieties.—Limed or Dutch nutmegs; covered with a white powder, lime.

Penang and Singapore nutmegs; unlimed.

False Nutmegs.—Myrística fátua, *Houttuyn*, wild or male nutmegs; 4 to 5 centimeters ($1\frac{1}{2}$ to 2 inches) long; kernel pale colored, slightly aromatic.

Torréya califórnica, *Torrey* (*Natural order*, Coniferæ), testa smooth, brittle; kernel oblong, marbled, terebinthinate.

Constituents.—Volatile oil 2 to 8 per cent., fixed oil 25 to 30 per cent., starch, proteids, mucilage, ash 2 per cent. Volatile oil of nutmeg has the spec. grav. 0.93, and consists of myristicene, $C_{10}H_{16}$, and a little myristicol, $C_{10}H_{14}O$. Expressed oil of nutmeg consists chiefly of myristin, with some myristic acid, palmitin, olein, resin, and about 6 per cent. volatile oil.

Properties.—Stimulant, stomachic. *Dose,* 0.5 to 1.5 grams (gr. viij–xxij).

GYNOCARDIA.—CHAULMUGRA.

Origin.—Gynocárdia (Chaulmoógra, *Roxburgh*) odoráta, *R. Brown.* *Natural order*, Bixineæ.

Habitat.—Malayan peninsula and Northeastern India.

Description.—Irregular ovate oblong, 2 to 3 centimeters ($\frac{4}{5}$–$1\frac{1}{5}$ inches) long, 10 to 12 millimeters ($\frac{2}{5}$–$\frac{1}{2}$ inch) broad, somewhat angular and flattish; testa dingy brown-gray, brittle; tegmen brown, thin; albumen brown, oily; embryo nearly of the length of the seed, with a thick club-shaped radicle, and two broad leafy-veined and somewhat heart-shaped cotyledons; odor slight; taste oily.

Constituents.—Fat 50 per cent., proteids, mucilage.

Properties.—Alterative, tonic; in larger doses emetic. *Dose,* 0.3 to 0.6 gram (gr. v–x); mostly used for preparing chaulmugra oil.

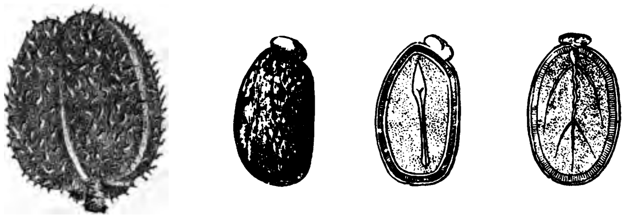
RICINUS.—CASTOR OIL SEED.

Origin.—Rícinus commúnis, *Linné.* *Natural order,* Euphorbiaceæ, Crotoneæ.

Habitat.—India; cultivated in tropical and warm temperate countries.

Description.—Variable in size and color; 10 to 20 millimeters ($\frac{2}{5}$–$\frac{4}{5}$ inch) long, about 8 millimeters ($\frac{1}{3}$ inch) broad, oval-oblong, flattened on the ventral surface; on one end with a whitish caruncle, covering the hilum and micropyle; chalaza near the broader end; raphe on the flat side; testa glossy, grayish or pale grayish-brown variegated with red-brown, brittle; tegmen white, thin, adhering to the white oily albumen; embryo straight, with a short conical radicle and two thin broad and veined cotyledons; inodorous; taste oily, acrid.

FIG. 239.



Ricinus fruit. Seed. Longitudinal sections.

Constituents.—Fixed oil 45 to 50 per cent. (see Oleum ricini), ricinin (crystalline, soluble in water and alcohol, sparingly soluble in ether and benzol), proteids 20 per cent., mucilage, sugar, ash (testa 10 per cent., kernel 4 per cent.). The poisonous principle is an albuminoid compound, ricin (Stillmark, 1888); it is soluble in 10 per cent. NaCl solution, precipitated by acids and re-dissolved by excess, coagulated by heat, precipitated by Mayer's reagent and by phosphotungstic acid.

Properties.—Violently cathartic and emetic; used for preparing castor oil.

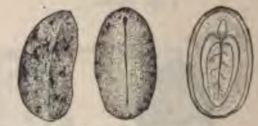
TIGLIUM.—Croton Seed.

Origin.—Cróton Tíglium, *Linné*, s. Tíglium officinále, *Klotzsch.* *Natural order*, Euphorbiaceæ, Crotoneæ.

Habitat.—China; cultivated in India.

Description.—About 12 to 15 millimeters (½ or ⅗ inch) long; oval-oblong, somewhat quadrangular, more or less flattened on the ventral side; surface dull gray-brown, or mottled with black from the removal of the outer coat; the caruncle usually absent from the commercial seed; otherwise like castor-oil seeds.

Fig. 240.



Croton Tiglium.—Lateral and ventral view, and longitudinal section of seed.

Constituents.—Fixed oil 50 to 60 per cent. (see Oleum Tiglii), proteids, including a poisonous phytalbumose, ash 3 per cent.

Properties.—Violently drastic; used for preparing croton oil.

CURCAS.—Purging Nut.

Origin.—Játropha Cúrcas, *Linné* (Cúrcas púrgans, *Adanson*). *Natural order*, Euphorbiaceæ, Crotoneæ.

Habitat.—Tropical America; naturalized in other tropical countries.

Description.—About 20 millimeters (⅘ inch) long; resembles croton seed, but the testa is dull black and marked with numerous small fissures; taste less acrid.

Constituents.—Fixed oil 40 per cent. (yellowish or colorless, vesicating), proteids, including a poisonous phytalbumose.

Properties.—Drastic and emetic; similar to, but milder than croton seed.

CAFFEA.—COFFEE.

Origin.—Cofféa (Cóffea) arábica, *Linné. Natural order,* Rubiaceæ, Ixoreæ.

Habitat.—Tropical Africa; cultivated in tropical countries.

Description.—Elliptic or oval, from 8 to 12 millimeters (⅓ to ½ inch) long, yellowish or bluish-gray, plano-convex, on the flat side with a longitudinal groove, penetrating with a curve deeply into the horny albumen; somewhat oblique on one end; hilum near the groove beneath the rounded end; testa membranous, brittle, usually wanting on the back; embryo small, at the oblique end, slightly curved under the convex side; odor faint, peculiar; taste somewhat bitter, astringent.

Varieties.—The cultivated varieties vary in size, color, and flavor. The large and well-flavored Liberian coffee is obtained from Cofféa libérica, *Hiern.*

Constituents.—Fat 13 per cent., glucose and dextrin 15 per cent., proteids 13 per cent., caffeine 1 to 1.3 per cent., caffeotannic acid, trace of volatile oil, ash 3 to 4 or 5 per cent. Caffeine, $C_8H_{10}N_4O_2$, is methyltheobromine (trimethyl-xanthine) in white silky needles, faintly bitter, sublimable, soluble in water, more so in alcohol and chloroform; on boiling with barium hydrate (or with potassa) converted into carbonic anhydrid, CO_2, and caffeidine, $C_7H_{12}N_4O$, and the latter ultimately into sarkosine, formic acid, methylamine, and ammonia. It is said not to produce spasms like theine, and its lethal dose to be smaller than that of theine.

Caffeotannin is amorphous, yields by oxidation viridinic acid, with boiling potassa yellow crystalline caffeic acid, and with fusing potassa protocatechuic acid.

By the roasting of coffee the fat, sugar, and tannin are destroyed, a little caffeine is lost with the water, and empyreumatic volatile oils (*caffeone*) are produced. The loss by roasting amounts to about 8 per cent. of water and 9 per cent. of organic matter.

Properties.—Tonic, stimulant, nervine, antiemetic. *Dose,* 4 to 16 grams (ʒj–iv), in infusion; caffeine 0.1 to 0.2 gram (gr. jss–iij).

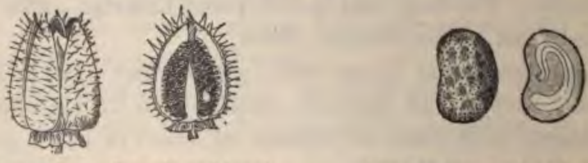
STRAMONII SEMEN.—STRAMONIUM SEED.

Thornapple seed.

Origin.—Datúra Stramónium, *Linné.* *Natural order,* Solanaceæ, Hyoscyameæ.

Habitat.—Asia; naturalized in most countries.

FIG. 241.



Stramonium.—Capsule and longitudinal section.

Stramonium seed and section, magnified 3 diam.

Description.—Reniform, flattened, about 4 millimeters (⅙ inch) long; hilum and micropyle on the concave edge; testa dull brownish-black, pitted and wrinkled; albumen whitish, oily, inclosing a cylindrical embryo curved parallel with the edge of the seed; inodorous; taste oily and bitter.

Constituents.—Fixed oil 25 per cent., resin, mucilage, proteids, ash 3 per cent., alkaloids 0.3 per cent. Daturine is a mixture of hyoscyamine and atropine. Scopolamine is also present. The oil contains daturic acid, $C_{17}H_{34}O_2$.

Properties.—Diuretic, dilating the pupil, narcotic. *Dose,* 0.06 to 0.2 gram (gr. j–iij), in powder, tincture, or extract.

Antidotes.—Evacuants (stomach pump, emetic); stimulants (brandy, coffee, etc.); hot and cold douches; morphine; pilocarpine.

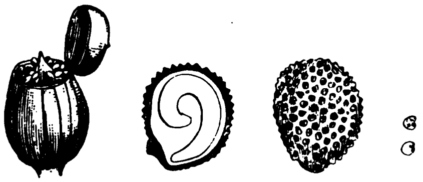
HYOSCYAMI SEMEN.—Hyoscyamus Seed.

Origin.—Hyoscyámus (Hyoscy'amus) níger, *Linné.* *Natural order,* Solanaceæ, Hyoscyameæ.

Habitat.—Europe and Asia; naturalized in some parts of North America.

Description.—Roundish-reniform; flattened, 1 to 1.5 millimeters ($\frac{1}{25}$ to $\frac{1}{16}$ inch) long; hilum and micropyle on the concave edge; testa finely pitted, roughish, light gray-brown; albumen whitish, oily, inclosing a cylindrical embryo curved parallel with the edge of the seed, but with the tip of the cotyledons incurved; inodorous; taste oily, bitter, somewhat acrid.

FIG. 242.



Hyoscyamus niger.—Fruit (pyxis) removed from calyx. Seed, natural size, magnified, and section.

Constituents.—Fixed oil 25 per cent., resin, mucilage, proteids, hyoscyamine, hyoscine (scopolamine), hyoscypicrin (bitter glucoside), ash 3 to 4 per cent.

Properties.—Anodyne, hypnotic, dilating the pupil, narcotic. *Dose,* 0.1 to 0.3 gram (gr. jss–v), in powder or emulsion.

Antidotes.—Same as for stramonium.

PAPAVER.—Poppy Seed, Maw Seed.

Origin.—Papáver somníferum, *Linné.* *Natural order,* Papaveraceæ, Papavereæ.

Habitat.—Western Asia; cultivated.

Description.—Reniform, 1 to 1.5 millimeters ($\frac{1}{25}$ to $\frac{1}{16}$ inch) long; hilum and micropyle on the concave side; testa varying in color, bluish, blackish, or whitish, with shallow pits; albumen whitish, oily, inclosing a cylindrical semilunar embryo; inodorous; taste oily.

Constituents.—Fixed oil 45 to 55 per cent., proteids about 16 per cent., mucilage, morphine (?), ash 6 to 7 per cent.

Properties.—Demulcent, mild anodyne. *Dose,* 1 to 4 grams (gr. xv–ʒj), in emulsion.

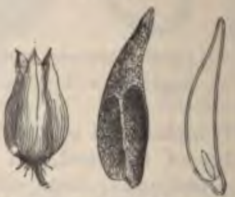
SABADILLA.—Cevadilla.

Schœnocaúlon (Asagræ'a, *Lindley;* Helónias, *Don*) officinále, *Asa Gray,* s. Verátrum Sabadílla, *Schlechtendal.* *Natural order,* Liliaceæ, Veratreæ.

Habitat.—Mexico to Venezuela.

Description.—Narrow-oblong or lance-linear, about 6 millimeters (¼ inch) long, rounded below, rather beaked above, somewhat angular; testa brownish-black, rugosely wrinkled, thin; albumen whitish and oily, with a small

Fig. 243.



Sabadilla.—Fruit natural size; seed and longitudinal section, magnified.

linear embryo near the base; inodorous, bitter, persistently acrid, sternutatory.

The papery follicles sometimes present should be rejected.

Constituents.—Veratrine, $C_{37}H_{53}NO_{11}$, cevadine, $C_{32}H_{49}NO_9$, cevadilline, $C_{34}H_{53}NO_8$, sabadine, $C_{29}H_{51}NO_8$, sabadinine, $C_{27}H_{43}NO_8$, angelic acid, $C_5H_8O_2$ (needles melt at 45° C.), methylcrotonic acid, $C_5H_8O_2$ (scales melt at 64.5° C.), cevadic acid (sublimable, odor of butyric acid, probably identical with the preceding), veratric acid (sublimable in prisms, melt at 180° C.), fixed oil, ash 3.5 per cent. Veratrine (of Wright and Luff) is amorphous, melts at 180° C., is sternutatory, and by potassa is split into veratric acid and amorphous verine, $C_{28}H_{45}NO_8$. Cevadine (Merck's veratrine) crystallizes from alcohol in prisms, melts at 205° C., is sternutatory, with sugar and H_2SO_4 is colored deep green and blue, and by potassa is split into methylcrotonic acid and amorphous cevine, $C_{27}H_{43}NO_8$. Cevadilline is amorphous and nearly insoluble in ether and benzol. Sabadine crystallizes from ether in needles, and is then nearly insoluble in ether, melts at 238° C., is not sternutatory, and, like the preceding alkaloids, is colored yellow, afterward red, by H_2SO_4. Sabadinine resembles sabadine, but is at once colored blood-red by H_2SO_4. Medicinal veratrine is a white powder, consisting of a mixture of the foregoing alkaloids, and probably of their derivatives, acrid, sternutatory, readily soluble in alcohol, ether, and chloroform, less freely soluble in glycerin and olive oil, and is colored yellow and deep red by sulphuric acid, yellow by nitric acid, and deep red by hot hydrochloric acid.

Properties.—Powerful irritant; used for preparing veratrine, and for killing vermin. *Dose*, of veratrine, 0.002 to 0.005 gram (gr. $\frac{1}{32}$ to $\frac{1}{12}$), in pills; mostly externally in ointment.

Antidotes.—Evacuation (stomach pump or emetic); tannin; stimulants (brandy, coffee, ammonia, etc.); application of warmth.

COLCHICI SEMEN.—COLCHICUM SEED.

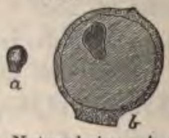
Origin.—Cólchicum autumnále, *Linné.* *Natural order*, Liliaceæ, Colchiceæ.

Habitat.—Europe, in meadows.

Description.—Subglobular, 2 to 3 millimeters ($\frac{1}{12}$ to $\frac{1}{8}$ inch) thick; hilum circular, furnished with a soft caruncle; testa dull reddish-brown, finely pitted, thin, but hard; albumen whitish, oily, horny, and tough, inclosing a small embryo nearly opposite the hilum; inodorous; taste bitter, somewhat acrid.

Constituents.—fixed oil 6 to 8 per cent., gum, starch sugar, ash 2.6 per cent., colchicine about 0.3 per cent., and derivatives of the latter. Colchicine, $C_{22}H_{25}NO_6$ (Zeisel, 1888), is a weak alkaloid, colorless or yellow, amorphous, fusible at 145° C., soluble in water, alcohol, and chloroform, less soluble in ether and benzol, of a saffron-like odor and bitter taste, precipitated by tannin, turns moist litmus paper slowly blue, and in aqueous solution is colored yellow by hydrochloric acid. It is the methylic ether of colchicein, $C_{21}H_{23}NO_6 + \frac{1}{2} H_2O$ (white crystals, melting and becoming anhydrous at 140° C., inodorous, soluble in alcohol, chloroform, and hot water, colored green by ferric chloride, and, after several days' standing, precipitated by

FIG. 244.



Colchici semen.—*a.* Natural size. *b.* Section, magnified.

tannin). Colchicoresin is brown, amorphous, soluble in chloroform and alcohol, insoluble in ether, and very sparingly soluble in cold water. Beta-colchicoresin is blackish-brown, soluble in strong alcohol and chloroform, and insoluble in water and ether. The last two principles are not, or but slightly, affected by tannin, are colored brown-green by ferric chloride, and dissolve in potassa with a brown color. Colchicine and colchicein yield with potassa yellow solutions. The four principles yield with sulphuric acid and potassium nitrate a deep blue or purplish-blue color, and, when this has disappeared, concentrated potassa solution gives a more permanent brick-red color. They are extracted from the unbroken seeds by digestion with alcoholic liquids, while maceration in the same exhausts only about two-thirds of the principles.

Properties.—Cathartic, emetic, sedative; in gout and rheumatism. *Dose*, 0.1 to 0.3 or 0.5 gram (gr. jss–v–viij), in powder, tincture, wine, or fluid extract.

Antidotes.—Evacuation (stomach pump or emetics); tannin; demulcents; stimulants.

GRANUM PARADISI.—Grain of Paradise.

Origin.—1. Amómum Gránum-paradísi, *Afzelius*. 2. Am. Meleguéta, *Roscoe*. *Natural order*, Scitamineæ, Zingibereæ.

Habitat.—Western Africa.

Description.—Roundish-angular, 2 to 3 millimeters ($\frac{1}{12}$ to $\frac{1}{8}$ inch) long; hilum at the slightly conical end, rather broad and depressed (Granum-paradisi), or grayish tufted (Melegueta); testa reddish-brown, finely warty; albumen whitish, mealy, and oily, inclosing a small embryo; odor slightly spicy; taste pungent, pepper-like.

Constituents.—Volatile oil 0.3 per cent., paradol, $C_9H_{14}O_2$, (viscid, pungent), tannin, fat, resin, starch, gum, ash 2 to 3 per cent.

Properties.—Stimulant; used mainly in cattle powder, and for imparting artificial strength to spirits.

ARECA.—ARECA NUT.

Origin.—Aréca Cátechu, *Linné*. *Natural order*, Palmeæ, Areceæ.

Habitat.—East Indies; cultivated.

Description.—Roundish conical, about 25 millimeters (1 inch) long, flattish at the hilum, externally brown, veined, internally horny, white, with dark brown veins; embryo near the hilum, small, conical; odor faint; taste slightly astringent.

Constituents.—Fat 14 per cent., several alkaloids, tannin, resin, mucilage, ash 2.2 per cent. Arecoline (methylarecaidine), $C_8H_{13}NO_2$, is oily, soluble in ether, alcohol, chloroform, and water; poisonous; yields crystallizable salts, and probably represents the tænifuge principle. Arecaine, $C_7H_{11}NO_2$, melts at 213° C.; the isomeric arecaidine melts at 222° C., and guvacine, $C_6H_9NO_2$, fuses at 271° C.; these three alkaloids crystallize, are soluble in water and diluted alcohol; insoluble, or nearly so, in absolute alcohol, ether, chloroform, and benzol, and are not poisonous.

Properties.—Astringent, tænifuge. *Dose*, 8 to 12 grams (ʒij–iij).

12. CELLULAR DRUGS NOT READILY RECOGNIZED AS DISTINCT ORGANS OF PLANTS.

This class embraces excrescences, hairs, glands, sporules, and such other vegetable drugs which do not belong to any of the preceding classes, and do not constitute a distinct organ of a plant, or are not readily recognizable as such. The starches, though not truly cellular, but being of a definite shape, are embraced in this class.

Classification.

Sect. 1. Not farinaceous.

Globular, tuberculated above.	Galla.
Irregular-ovate, tuberculated or lobed, hollow; shell thin.	Gallæ chinenses et japonicæ.

Irregular pieces, white, friable, very bitter.	Fungus laricis.
Felt-like pieces, soft, brown, glossy, tasteless.	Fungus chirurgorum.
Irregular-globose, falling into a brown-black powder.	Ustilago.
Narrow oblong and subtriangular, three-grooved.	Ergota.
Cylindrical, brownish, horn-like.	Laminaria.
Cylindrical, white, spongy, mucilaginous.	Sassafras medulla.
Flat, divided into narrow bands, aromatic.	Macis.
Thread-like, notched above, orange-brown red.	Crocus.
Long, silky, thread-like, yellowish.	Stigmata maydis.
Curling, white filaments; under the microscope band-like.	Gossypium.
Curling, brown, glossy filaments, under the microscope jointed.	Cibotium.
Stiff, brown-red, under the microscope retrorsely serrate.	Mucuna.
Pulverulent, brick-red, consisting of hairs and glands.	Kamala.
brown or dark purple, mixed with wood fibres.	Araroba.
brown-yellow, aromatic, under the microscope subglobular or hood-shaped.	Lupulinum.
pale yellow, tasteless, under the microscope tetrahedral.	Lycopodium.
Viscid liquid, containing roundish cells.	Fermentum.

Sect. 2. Farinaceous.

I. Unaltered starch granules, consisting of more or less distinct layers.	Amylum.
II. Granules partly altered.	
Globular grains; granules oblong, truncate.	Sago.
Irregular lumps; granules muller-shaped.	Tapioca.
III. Granules wholly or partly inclosed in tissue.	
Globular grains with a brown groove; granules similar to wheat starch.	Hordeum.
Meal; granules polyhedral, small, united to globules.	Avena.

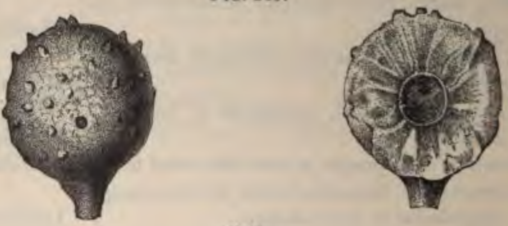
GALLA.—NUTGALL.

Origin.—Excrescences on Quércus lusitánica, *Webb*, var. infectória, *De Candolle*, s. Q. infectória, *Olivier* (*Natural order*, Cupuliferæ), caused by the punctures and deposited ova of Cy′nips gállæ tinctóriæ, *Olivier* (*Class*, Insecta. *Order*, Hymenoptera).

Habitat.—Levant.

Description.—Subglobular, 2 centimeters ($\frac{4}{5}$ inch) or less in diameter, with a short stipe, more or less tuberculated above, otherwise smooth; heavy, hard, often with a circular hole near the middle, blackish-olive-green or blackish-gray; fracture granular, grayish; in the centre a subglobular cavity containing either the partly developed insect or pulverulent remains left by it, with remnants of the starchy parenchyme. The cavity is inclosed by a hard shell, composed of stone cells; outside of it the tissue consists of parenchyme, chiefly containing tannin, and of a few soft wood bundles. Nutgalls are nearly inodorous, and have a strongly astringent taste.

FIG. 245.



Entire. Galla. Section.

Light, spongy, and whitish-colored nutgall should be rejected.

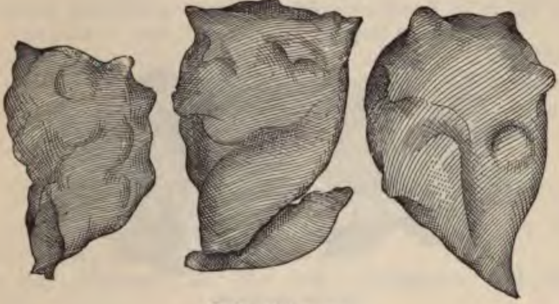
Varieties.—Aleppo, or Syrian nutgalls, dark colored and heavy.

Smyrna nutgalls, of a grayish-olive color, intermixed with white galls.

Sorian nutgalls, size of a pea; blackish.

Indigenous nutgalls, globular, smooth, or tuberculate, white or blackish, spongy or firm, varying according to origin; the galls of Quércus vírens, *Aiton*, are of a firm texture, dark color, and rich in tannin (40 per cent.).

FIG. 246.



Gallæ chinenses.

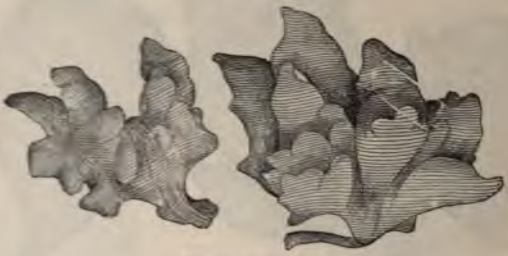
California oak balls, from Quércus lobáta, *Engelmann*, are globular, 5 centimeters (2 inches) in diameter, orange-brown, internally white and spongy; very astringent.

Chinese nutgalls, from Rhus semialáta, *Murray*, by the sting of A′phis chinénsis, *Bell*; about 4 or 5 centimeters (1½ to 2 inches) long, ovate, but very irregular, tuberculate, grayish-downy, hollow; shell thin, fragile, inclosing the remnants of numerous insects.

Japanese nutgalls, from Rhus semialáta or an allied species; about 2 to 3 centimeters (⅘ to 1⅕ inches) long, usually lobed, and the lobes tuberculate, densely pubescent; contains starch granules; otherwise like the preceding.

Constituents.—Tannin 50 to 60 per cent. (white galls about 30 per cent.), gallic acid 2 to 3 per cent., mucilage, sugar, resin, and, in the nucleus, starch. Tannin, gallotannic acid or digallic acid, $C_{14}H_{10}O_9$, is yellowish-white, amorphous, insoluble in absolute ether, chloroform, benzol, benzin, and carbon disulphide, soluble in glycerin, alcohol, and water, precipitated blue-black by ferric salts and white by gelatin. Commercial tannin contains a little odorous and coloring matter and variable quantities of glucose. Gallic acid, $C_7H_6O_5.H_2O$, is in white silky needles, soluble in alcohol and boiling water, less so in ether, and sparingly soluble in cold water; the aqueous solution is colored red by potassium cyanide, is precipitated blue-black by ferric salts, the color disappearing on boiling, and is not affected by gelatin, except in the presence of gum. The tannin of Chinese nutgalls differs somewhat from that of the officinal nutgalls.

FIG. 247.



Gallæ japonicæ.

AGARICUS ALBUS.—FUNGUS LARICIS, WHITE AGARIC.

Origin.—Poly'porus officinális, *Fries*, s. Bolétus láricis, *Jacquin*. *Natural order*, Fungi, Hymenomycetes.

Habitat.—Asia and Europe, on the larch (Larix).

Description.—Deprived of the outer rind; hoof-shaped or conical, about 15 centimeters (6 inches) broad, usually in irregular pieces, white, light, somewhat fibrous and spongy, very friable, but not readily pulverizable; odor faint; taste sweetish, acrid, and very bitter.

Constituents.—Agaricin, $C_{16}H_{30}O_5$ (also known as agaric acid or laricin; white, crystalline, soluble in hot alcohol and glacial acetic acid, less soluble in ether and chloroform, almost insoluble in benzol), about 25 per cent. of bitter resin (brown-red, soluble in cold alcohol, chloroform, benzol, etc., purgative), resins sparingly soluble in cold alcohol, an indifferent crystalline substance about 4 per cent., white amorphous substance separating jelly-like, 3 or 4 per cent., sugar (mannit?), and fumaric, citric, and malic acids.

Properties.—Antisudoral, purgative, in large doses emetic. *Dose,* 0.2 to 0.6 gram (gr. iij–x), in powder, tincture, or extract; of agaricin 0.005–0.010 gram (gr. $\frac{1}{12}$–$\frac{1}{6}$) as antisudoral.

FUNGUS CHIRURGORUM.—SURGEON'S AGARIC.

Origin.—Poly′porus (Bolétus, *Linné*) fomentárius, *Fries. Natural order,* Fungi, Hymenomycetes.

Habitat.—Europe, on the oak (Quercus) and beech (Fagus).

Description.—Deprived of the harder rind, cut into slices, boiled in lye, washed and beaten. Felt-like, soft-velvety pieces, brown, glossy, nearly inodorous, tasteless; consists of interlaced filiform cells. Impregnated with potassium nitrate it constitutes spunk or touchwood.

Uses.—Externally for arresting hemorrhage.

USTILAGO.—CORNSMUT.

Origin.—Ustilágo May′dis, *Léveillé. Natural order,* Fungi, Æcidiomycetes.

Habitat.—Upon all parts of Zea Mays, *Linné,* most frequently upon the inflorescence.

Description.—Irregular globose masses, sometimes 15 centimeters (6 inches) in diameter, consisting of a blackish gelatinous membrane, inclosing innumerable brown-black, globular, and nodular spores; odor and taste disagreeable.

Constituents.—Fixed oil 2.5 per cent., probably sclerotic acid, crystalline principle (soluble in carbon disulphide), crystalline alkaloid (bitter, soluble in ether), volatile base, sugar, mucilage, ash 5 per cent.

Properties.—Emmenagogue, parturient. *Dose,* 1 to 2 grams (gr. xv–xxx).

ERGOTA.—Ergot.

Secale cornutum.

Origin.—Clávieeps purpúrea, *Tulasne.* *Natural order,* Fungi, Ascomycetes.

Habitat.—In the inflorescence of Secále cereále, *Linné,* and other grasses.

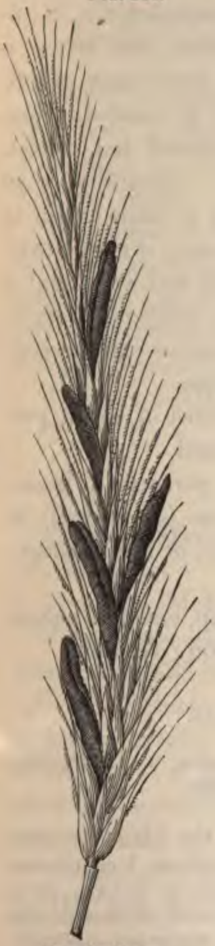
Description.—Somewhat fusiform, obtusely triangular, usually curved, about 20 to 40 millimeters ($\frac{4}{5}$–$1\frac{1}{2}$ inches) long, 3 or 4 millimeters ($\frac{1}{8}$–$\frac{1}{6}$ inch) thick, three-furrowed, attenuated and obtuse at both ends, purplish-black, often transversely fissured, internally whitish, breaking with a short fracture; odor peculiar, heavy, increased by trituration with solution of potassa; taste oily, unpleasant.

Ergot grows from a loose white mycelium, which in its early stage is accompanied by an unpleasantly sweet mucus, and penetrates into the ovary. In the following spring stiped fruit-heads are produced, containing numerous bottle-shaped conceptacles (perithecia) with fusiform spore-sacs (asci) inclosing 8 filiform spores.

Ergot should be kept in a dry place, and renewed every year.

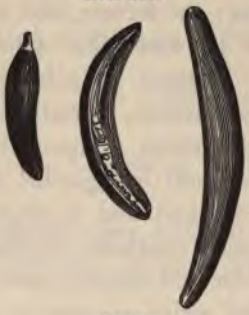
Constituents.—Mostly difficult to isolate and purify, owing to their amorphous condition and changeable nature. The following have been obtained: Fixed oil 30 per cent., mannit, mycose, proteids, cholesterin, ash about 3 per cent. (mainly phosphates), scleromucin 2–3 per cent. (brown, tasteless, after drying insoluble in water; ecbolic; according to Kobert, impure ergotic acid), sclererythrin $\frac{1}{100}$ per cent. (soluble in alcohol, ether, and in alkalies with a deep red color), scleroiodin (not soluble in simple solvents, violet in alkalies), picrosclerotin (poisonous), sclerocrystallin and scleroxanthin (crystalline, soluble in ether, inert).

FIG. 248.



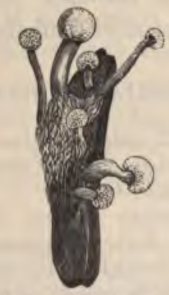
Ergotized rye.

FIG. 249.



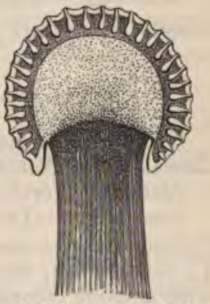
Ergota.

Fig. 250.



Ergot with fruit-heads.

FIG. 251.



Section of head, showing conceptacles.

Two acids possessing ecbolic properties have been obtained in different stages of purity and named sphacelic and sclerotic (ergotic) acid; both are amorphous and nearly tasteless; the former, also known as sphacelotoxin, is insoluble in water, but soluble in alkalies; the latter is soluble in water. Of alkaloids prepared from ergot, ergotinine is colorless, crystalline, fluorescent in alcohol, ether, and chloroform solutions, by H_2SO_4 colored red, violet, and blue, and is regarded as harmless. Cornutine is an active alkaloid, and is probably present to some extent in the impure alkaloids ecboline and ergotine; it is of a reddish color and entirely insoluble in ether and water and is the chief active constituent of alcoholic extracts of ergot, which contain also sphacelic acid. Aqueous extracts contain principally ergotic acid and sphacelates.

Bonjean's ergotin is the aqueous extract of ergot, precipitated by alcohol, filtered and evaporated.

Properties.—Emmenagogue, ecbolic, parturient, hemostatic, poisonous. *Dose,* 0.3 to 1.5 grams (gr. v–xxij), in powder (freshly prepared), infusion, wine, or fluid extract; ergotin 0.06 to 0.2 gram (gr. j–iij).

Antidotes.—Evacuants (stomach pump, emetics, purgatives); stimulants; amyl nitrite inhalation; frictions.

LAMINARIA.—LAMINARIA.

Origin.—Laminária Cloústoni, *Edmonston,* s. L. digitáta, *Lamouroux.* *Natural order,* Algæ, Fucoideæ.

Habitat.—North Atlantic Ocean.

Description.—The stipitate portion of the plant is used. Cylindrical or somewhat flattened pieces about 1 centimeter ($\frac{2}{5}$ inch) thick, deeply wrinkled, brownish or brown, often with a saline efflorescence, horn-like, sometimes hollow in the centre (from old plants); after soaking in water brown-green, elastic, and four or five times the former thickness; in the outer layer with large mucilage cells; odor slight seaweed-like; taste mucilaginous, saline.

Constituents.—Mucilage, mannit, salts.

Properties.—Absorbent, dilatant; turned cylindrical or conical, used as tents.

SASSAFRAS MEDULLA.—Sassafras Pith.

Origin. — Sássafras officinális, *Nees.* *Natural order,* Laurineæ, Litseaceæ.

Habitat.—North America, from Ontario to Florida and Eastern Texas.

Description.—Slender cylindrical pieces, often curved or coiled, light, spongy, white, inodorous, insipid; consisting entirely of parenchyme.

Constituents.—Mucilage; from its aqueous solution it is not precipitated by alcohol or subacetate of lead.

Properties.—Demulcent; used mostly in collyria.

MACIS.—Mace.

Origin.—Myrística frágrans, *Houttuyn.* *Natural order,* Myristicaceæ.

Habitat.—Molucca Islands; cultivated in the tropics.

Description.—It is the arillus of nutmeg. In narrow bands, about 25 millimeters (1 inch) long, and 1 millimeter ($\frac{1}{25}$ inch) thick, somewhat branched and lobed above, united to broader pieces at the base; of a brownish-orange color, fatty when scratched or pressed; fracture short, showing numerous yellow oil cells; fragrant; taste warm, aromatic.

Constituents.—Volatile oil 8 per cent. (mostly macene, $C_{10}H_{16}$, with little oxygenated compound), resin, fat, sugar, dextrin, mucilage, proteids, no starch granules, ash 1.5–2 per cent.

Properties.—Stimulant, tonic; used chiefly for flavoring.

CROCUS.—SAFFRON.

Origin.—Crócus satívus, *Linné. Natural order*, Irideæ, Sisyrinchieæ.

Habitat.— Western Asia; cultivated for commerce mainly in Spain and France.

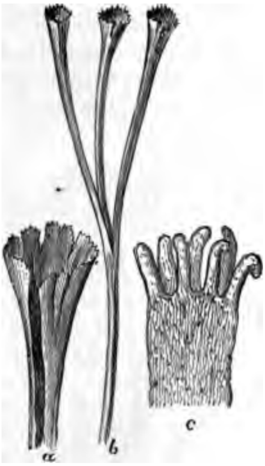
Description.—It consists of the stigmas, which are separate, or three attached to the top of the style, about 3 centimeters (1⅕ inches) long, flattish-tubular, almost thread-like, broader and notched above; orange-brown red; crisp and somewhat elastic; odor peculiar, aromatic; taste bitterish and aromatic. When chewed it tinges the saliva deep orange-yellow. It consists of thin-walled elongated parenchyme and of delicate vascular veins, repeatedly forked, a vein terminating in each tooth.

Saffron should not be mixed with the yellow styles, and should not be sticky (glycerin). When pressed between filtering paper, it should not leave an oily stain. When soaked in water, it colors the liquid orange-yellow, and should not deposit any pulverulent mineral matter, nor show the presence of organic substances differing in shape from that described (stamens, corolla-tubes, safflower, calendula, etc.). For adulterating saffron mineral matters are made to adhere to the drug by means of syrup or glycerin, or it is impregnated with concentrated solutions of alkali salts, or with cheaper coloring matters. Sodium nitrocresylate dissolves in petroleum spirit with a lemon-yellow color; the coloring matter of saffron is insoluble.

Varieties.—Commercial saffron is mostly of Spanish or French (Gatinais) origin. African saffron is usually safflower (carthamus). Cape saffron consists of the corolla of Lypéria crócea, *Ecklon, natural order*, Scrophularineæ.

Constituents.—Volatile oil, $C_{10}H_{16}$, 1 per cent., fixed oil, wax, mucilage, sugar, proteids, ash 5 per cent., moisture about 12 per cent., picrocrocin and crocin (polychroit), $C_{44}H_{70}O_{28}$. The latter is amorphous, brown-yellow, insoluble in ether, soluble in ordinary alcohol and water, and is split into sugar (crocose), and red crocetin (formerly called crocin), $C_{34}H_{46}O_9$, which is soluble in ether and alcohol, nearly insoluble in water, and is colored blue by sulphuric acid, like crocin. Picrocrocin, $C_{38}H_{66}O_{17}$, forms colorless bitter needles, is readily soluble in alcohol and water, less so in chloroform, sparingly soluble in ether, and with acids or alkalies yields crocose and the volatile oil, $C_{10}H_{16}$.

FIG. 252.



Crocus —*a*. Stigma, upper part, magnified 4 diam. *b*. Style with stigmas. *c*. Papillose margin of stigma, magnified 120 diam.

Properties.— Diaphoretic, carminative, emmenagogue, anodyne, mildly sedative. *Dose*, 0.3 to 2 grams (gr. v–xxx), in powder, infusion, tincture, or syrup.

MAYDIS STIGMATA.—CORNSILK.

Origin.—Zéa Mays, *Linné.* *Natural order,* Gramineæ, Maydeæ.

Habitat.—Tropical America; cultivated in the warm temperate zone.

Description.—The stigmas are collected. Fine thread-like, 15 centimeters (6 inches) or more long, about 0.5 millimeter ($\frac{1}{50}$ inch) broad, yellowish or greenish, soft-silky, finely hairy, inodorous, taste sweetish.

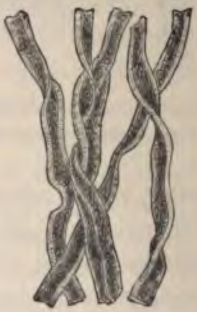
Constituents.—Sugar, mucilage; maizenic acid (composition? soluble in water, alcohol, and ether), fixed oil, resin, salts.

Properties.—Diuretic, lithontriptic. *Dose,* about 2 grams (ʒss) in decoction or syrup; of the aqueous extract, 0.3 to 0.5 gram (gr. v–viij).

GOSSYPIUM.—COTTON.

Origin.—Gossy'pium herbáceum, *Linné,* and other species of Gossypium. *Natural order,* Malvaceæ, Hibisceæ.

FIG. 253.



Cotton fibres.

Habitat.—Tropical Asia and Africa; cultivated in tropical and subtropical countries.

Description.—The hairs attached to the seeds are used. One-celled filaments, about 2 (short staple) to 4 (long staple) centimeters ($\frac{4}{5}$–1$\frac{3}{5}$ inches) long, and about 0.02 millimeter (0.0008 inch) broad; white, soft, curling, under the microscope appearing as flattened, hollow, and twisted bands, which are spirally striate and slightly thickened at the obtuse edges; inodorous, tasteless, insoluble in water, alcohol, ether, and potassa solution; blackened by warm solution of stannic chloride, not dyed by picric acid, soluble in ammoniacal solution of copper sulphate.

Constituents.—Cellulose, inorganic constituents 1.5 per cent., fixed oil 9–10 per cent., the latter removed by repeated boiling with caustic alkali (absorbent cotton).

Uses.—For preparing collodion and for surgical dressings.

CIBOTIUM.—PENGHAWAR.

Penghawar-Djambi, Paku-kidang, Pulu.

Origin.—Cibótium Báromez, *J. Smith*, Cib. djambiánum, *Hasskarl*, and other species of ferns. *Natural order*, Filices, Cyatheaceæ.

Habitat.—Sumatra, Java, and islands of the Pacific.

Description.—The chaffy hairs of the bases of the fronds and stem are collected. Curling filaments, about 0.05 millimeter (0.002 inch) broad, glossy, brown or brown-yellow; under the microscope flat and jointed; inodorous, tasteless. Penghawar is about 25 millimeters (1 inch) long, and of a yellowish tint. Paku-kidang, from Alsóphila lúrida, *Hooker*, etc., is about 5 centimeters (2 inches) long, and of a brown color. Pulu, or Pulu-pulu, from Cibótium glaúcum, *Hooker*, etc., is slightly curling and very soft.

Cibótium Schiédei, *Schlechtendal*, of Mexico, yields a similar product.

Constituents.—Humin compounds, little resin, wax, trace of tannin (green with iron).

Properties.—Hemostatic through the mechanical absorption of the blood serum.

MUCUNA.—COWAGE.

Origin.—Mucúna (Stizolóbium, *Persoon*; Dólichos, *Linné*) prúriens, *De Candolle*. *Natural order*, Leguminosæ, Papilionaceæ, Phaseoleæ.

Habitat.—East and West Indies.

Description.—The hairs attached to the legumes are used. One-celled, 2 or 3 millimeters ($\frac{1}{12}$–$\frac{1}{8}$ inch) long, stiff, brown-red, under the microscope appearing sharp-pointed, retrorsely serrate, rather thick-walled and partly filled with a brown granular matter. The hairs easily penetrate the skin, causing violent itching.

Constituents.—Little tannin and resin.

Mucúna úrens, *De Candolle,* yields shorter and darker hairs, which are equally irritating.

Properties.—Anthelmintic, externally irritant. *Dose,* 0.1 to 0.2 gram (gr. jss–iij), mixed with syrup.

KAMALA.—KAMALA.

Origin.—Mallótus philippinénsis, *Mueller Arg.* (Rottléra tinctória, *Roxburgh*). *Natural order,* Euphorbiaceæ, Crotoneæ.

Habitat.—India, China, Philippine Islands, Australia; possibly also in Abyssinia.

Description.—The glands and hairs of the capsules are collected. Granular, mobile, brick-red, inodorous and nearly tasteless powder, imparting a deep red color to alkaline liquids, alcohol, ether, and chloroform; boiling water yields a pale yellow solution, becoming brown with ferric chloride. Under the microscope Kamala is seen to consist of stellately arranged colorless hairs, mixed with depressed globular glands, containing from 40 to 60 red club-shaped vesicles. When heated in a crucible to redness, it leaves an ash, weighing not over 8 per cent. of the drug.

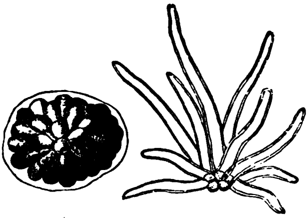
Constituents.—Resins nearly 80 per cent., one soluble in cold, the other in hot alcohol; rottlerin, $C_{22}H_{20}O_6$ (yellowish needles, soluble in hot alcohol, in ether, benzol, carbon disulphide and, with a red color in alcohol; altered on exposure to air), albuminous matter and cellulose, each 7 per cent., ash about 3 per cent.

Adulteration.—Earthy matters, sometimes to the extent of 60 per cent.; best detected by incineration.

Properties.—Tænifuge. *Dose,* 4 to 8 or 12 grams (ʒj–ij–iij), in powder or electuary.

Substitute.—Wars or Wurrus from Flemíngia rhodocárpa, *Baker;* Papilionaceæ, Phaseoleæ; indigenous to Eastern Africa. The powder is coarser than Kamala, is deep purple, has a slight odor, becomes black in the water-bath, and consists of cylindrical or subconical glands, enclosing several tiers of oblong vesicles. Used as a vermifuge, in skin diseases, and as a dye. An inferior kind of wars consists of altered starch of flemingia seeds mixed with red sand (Flückiger). It contains resins 73, albuminous matter 8, cellulose 7.5, and ash 6 per cent.

FIG. 254.



Kamala.—Magnified 190 diam.

ARAROBA.—GOA POWDER.

Origin.—Andíra Araróba, *Aguiar.* *Natural order,* Leguminosæ, Papilionaceæ, Dalbergieæ.

Habitat.—Brazil.

Description.—Collected from radial clefts of the wood. When fresh, light yellow, after exposure ochre-colored, umber-brown, or brown-purple; somewhat crystalline, rough, mixed with wood-fibres; inodorous, bitter. Water dissolves about 7 per cent., the solution being brownish; benzol dissolves about 80 per cent., and subsequently alcohol about 2 per cent.; the insoluble portion consists mostly of wood fibres.

Constituents.—Gummy matter, resin, and chrysarobin, ($C_{30}H_{26}O_7$ (orange-yellow, crystalline, soluble in alcohol and ether, more freely soluble in chloroform and benzol; the solution in potassa is yellow, has a green fluorescence, and becomes red, when it contains chrysophanic acid); ash about 0.5 per cent.

Properties.—Irritant; used externally in skin diseases.

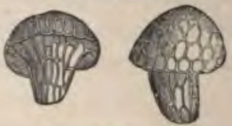
LUPULINUM.—Lupulin.

Origin.—Húmulus Lúpulus, *Linné.* *Natural order,* Urticaceæ, Cannabineæ.

Habitat.—Northern temperate zone; cultivated.

Description.—The glands attached to the axis and bracts of the strobiles are collected. Bright, brownish-yellow, becoming yellowish-brown; resinous, aromatic, and bitter, consisting of minute granules, which, under the microscope, are subglobular or rather hood-shaped, and reticulate, the lower half being obtusely conical. When agitated with water and allowed to stand, no appreciable sediment consisting of sand should be deposited.

Fig. 255.



Lupulin (fresh).

Constituents.—Volatile oil 3 per cent., choline (formerly called lupuline, strongly alkaline liquid, not bitter, probably from the decomposition of lecithin; on boiling yields trimethylamine), resin, wax (myricin), lupamaric acid, $C_{25}H_{35}O_4$ (bitter prisms, insoluble in water, freely soluble in diluted and strong alcohol, ether, chloroform and other solvents, turns yellow and resinous on exposure, with HNO_3 turns red, changing to orange on dilution or with an alkali), ash about 5 per cent. The volatile oil, on exposure, yields valerianic acid.

Properties.—Stimulant, tonic, anodyne. *Dose,* 0.2 to 0.5 or 1 gram (gr. iij–viij–xv), in powder, tincture, fluid extract, or oleoresin.

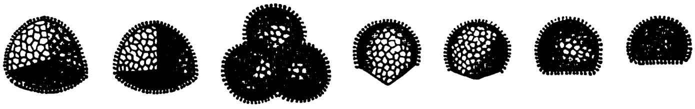
LYCOPODIUM.—LYCOPODIUM.

Origin.—Lycopódium clavátum, *Linné,* and other species of Lycopodium. *Natural order,* Lycopodiaceæ.

Habitat.—Europe, Asia, and North America, in dry woods.

Description.—A fine powder, pale yellowish, very mobile, inodorous, tasteless, not wetted by water, burning quickly when thrown into a flame. Viewed under the microscope the granules are seen to be tetrahedral, reticulated, rounded on one side and on the edge with short projections.

FIG. 256.

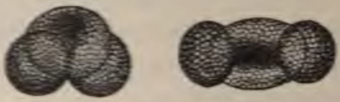


Lycopodium.

Constituents.—Fixed oil 47–49 per cent., cane sugar 2 per cent., volatile base (methylamine) in minute quantity; ash 1.15 per cent. (and 3 or 4 per cent. of sand, etc.), containing 45.7 per cent. of P_2O_5. The oil contains a peculiar oleic acid, $C_{16}H_{30}O_2$ (*Langer,* 1889).

Uses.—For protecting excoriated surfaces, and for preventing the mutual adhesion of pills.

FIG. 257.



Pollen of pine.

Adulterations.—Pine pollen consists of an elliptic cell, at both ends of which a globular cell is attached. Starch is colored blue by iodine. Powdered turmeric is colored red-brown by alkalies. Mineral admixtures subside in carbon disulphide and increase the yield of ash.

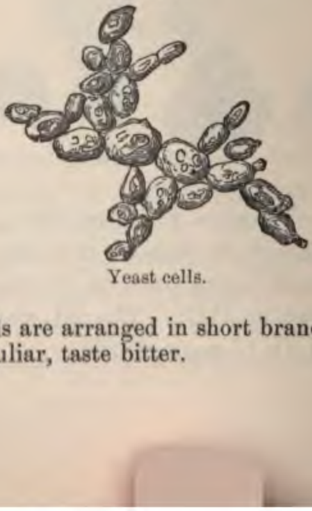
FERMENTUM.—YEAST.

Origin.—Tórula (Saccharomy'ces, *Meyen*) cerevísiæ, *Turpin.* *Natural order,* Fungi, Saccharomycetes.

Habitat.—In fermenting malt liquors.

Description.—A viscid liquid or semifluid frothy mass, containing numerous isolated roundish or oval cells (bottom yeast), or the cells are arranged in short branching rows (top yeast); odor peculiar, taste bitter.

FIG. 258.



Yeast cells.

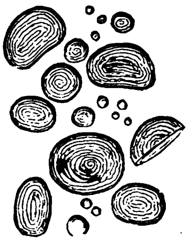
Properties.—Tonic, stimulating, laxative, antiseptic. *Dose*, 30 to 65 grams (℥j–ij); externally for poultices.

AMYLUM.—STARCH.

Origin.—In most vegetables. For medicinal and dietetic purposes, and for uses in the arts, starch is prepared from amylaceous seeds, tubers, rhizomes, and palm stems.

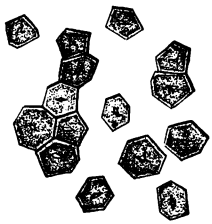
Description.—Fine white powder, sometimes superficially adhering so as to form irregular angular or columnar masses, white, inodorous, tasteless, insoluble in ether, alcohol, and cold water; under the microscope, appearing as minute granules, varying in size and shape according to origin, and consisting of more or less distinct concentric or excentric layers, which are arranged around a cavity called the hilum or nucleus. Its ultimate composition is, $C_6H_{10}O_5$, but it consists of a mixture of various modifications of starch-cellulose and starch-granulose, the latter becoming blue with iodine. Boiled with water the granules are ruptured and dissolve, yielding, on cooling, a jelly or mucilaginous liquid acquiring a blue color with iodine. Heated to 180° C. (356° F.) starch is converted into dextrin. Boiled with dilute sulphuric acid, starch yields different

FIG. 259.



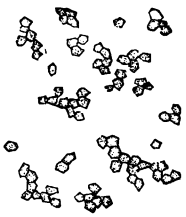
Wheat starch.

FIG. 260.



Corn starch.

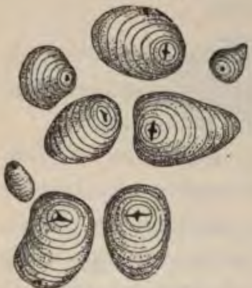
FIG. 261.



Rice starch.

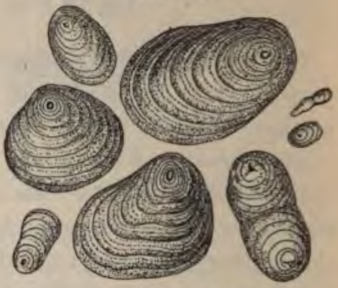
dextrins (colored violet or red, or not affected by iodine), and finally glucose (dextrose).

FIG. 262.



Maranta starch.

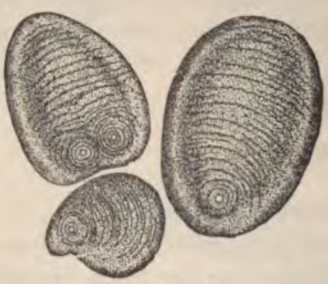
FIG. 263.



Potato starch.

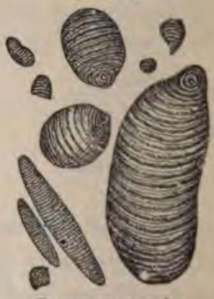
Starch soluble in water has been observed in the epidermal layers of some plants. Some starches acquire a yellow and brown color with iodine, and probably consist mainly of starch cellulose.

FIG. 264.



Canna starch.

FIG. 265.



Curcuma starch.

The most important starches found in commerce may be distinguished by the microscopic appearance of the granules, as follows (the cuts represent the starch granules magnified 250 diameters):

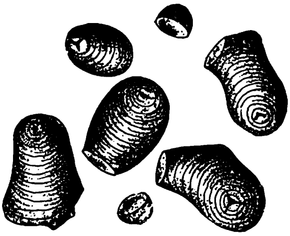
Lenticular, large and minute granules; layers indistinct; hilum slight, near the centre.	Tríticum vulgáre.
Polyhedric, uniform; size of wheat starch (nearly); hilum central, large.	Zéa Mays.
Polyhedric, uniform; much smaller; hilum small.	Ory′za satíva.
Ovate; layers delicate, distinct; hilum at broad end, often cleft.	Maránta arundinácea.
Ovate or roundish ovate; larger than preceding; layers very distinct; hilum rather small at the narrow end.	Solánum tuberósum.
Ovate or ovate-oblong; larger than preceding; layers numerous, delicate; hilum inconspicuous, mostly at the narrow end.	Cánna spec.
Elliptic, flat, contracted at one end; layers numerous, delicate; hilum small at the narrow end.	Cúrcuma spec.

SAGO.—Pearl Sago.

Origin.—Metróxylon Ságu, *Rottboell*, and M. Rúmphii *Martius* (Ságus Rúmphii, *Willdenow*), and other palms. *Natural order*, Palmæ, Lepidocaryæ.

Habitat.—East India Islands; cultivated.

Fig. 266.



Sago starch.

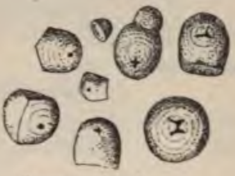
Description.— Globular, pearl-like grains, prepared by granulation with heat; white or brownish, somewhat diaphanous; the unaltered starch granules oblong, elliptic, or ovate, truncate at one end; layers more or less distinct; hilum at the rounded end often cleft.

TAPIOCA.—Tapioca.

Origin.—Mánihot utilíssima, *Pohl* (Játropha Mánihot, *Linné*), and Mánihot Aípi, *Pohl* (Jatr. dúlcis, *Gmelin*). *Natural order*, Euphorbiaceæ, Crotoneæ.

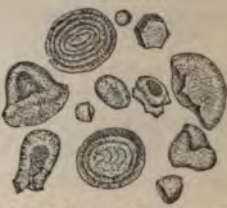
Habitat.—Brazil; cultivated in the tropics.

Fig. 267.



Cassava starch.

Fig. 268.



Altered starch granules from tapioca.

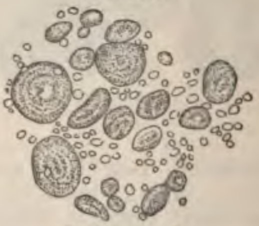
Description.—The starch of the rhizome (cassava starch), while still moist, is dried on heated plates. Irregular lumps, white and opaque or somewhat diaphanous; the unaltered starch granules muller-shaped; layers indistinct; hilum near the rounded end, small, often cleft.

HORDEUM.—Pearl Barley.

Origin.—Hórdeum dístichum, *Linné*, and other cultivated species of Hordeum. *Natural order*, Gramineæ, Hordeeæ.

Habitat.—Asia; cultivated.

Fig. 269.



Barley starch.

Description.—The fruit is almost completely deprived of the integuments. Globular, white, mealy, on one side with a groove, containing remnants of the brown integuments; the starch granules resemble those of wheat, but are rather smaller; a portion of the gluten is present.

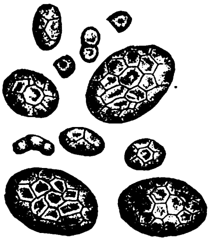
AVENÆ FARINA.—OAT MEAL.

Origin.—Avéna satíva, *Linné.* *Natural order*, Gramineæ, Aveneæ.

Habitat.—Probably Asia; cultivated.

Description.—Meal not uniform, grayish-white, containing the gluten and fragments of the integuments; taste bitterish; the starch granules polyhedric, or muller-shaped, often united to subspherical or ovoid masses; layers scarcely observable; hilum rather indistinct.

FIG. 270.



Oat starch.

Properties.—Starches are demulcent; farinaceous substances containing both starch and gluten, are demulcent and nutritive.

PART III.

DRUGS WITHOUT CELLULAR STRUCTURE.

THESE comprise secretions, exudations, and other organic products which are destitute of cellular structure, though fragments of tissue are in some of them always present, and which, if of animal origin, like some of the fats, are not readily recognized as such.

1. EXTRACTS AND INSPISSATED JUICES.
EXTRACTA ET SUCCI INSPISSATI.

These are of black or brown color, either wholly or partly soluble in water or alcohol, yielding brown-colored solution; two of the inspissated milk-juices are completely insoluble in both menstruums.

Classification.

Sect. 1. Wholly or partly soluble in water and alcohol.	
I. Taste bitter.	
Containing fragments of tissue; also starch and tannin; red-brown, black-green by ferric salts.	Guarana.
Fragments of tissue; neither starch nor tannin; red-brown, blood-red by ferric salts.	Opium.
Neither tissue, starch, nor tannin; gray-brown, not altered by ferric salts.	Lactucarium.
dark orange-brown, black by ferric salts.	Aloe.
blackish-brown, poisonous.	Curare.

II. Taste sweet.	
Brown black, glossy.	Extractum glycyrrhizæ.
III. Taste astringent and sweetish.	
Dark brown, more or less glossy; black-green by ferric salts.	Catechu.
Brown, earthy, crystalline; black-green by ferric salts.	Gambir.
Brown-red, angular pieces; black-green by ferric salts.	Kino.
Black-brown, somewhat acrid; blue-black by ferric salts.	Monesia.
Brown-red; violet-black by ferric salts.	Extr. hæmatoxyli.
Sect. 2. Insoluble in water and alcohol.	
Plastic in hot water.	Gutta percha.
Elastic at ordinary temperature.	Elastica.

GUARANA.—GUARANA.

Origin.—Paullínia sórbilis, ***Martius.*** *Natural order,* Sapindaceæ, Sapindeæ.

Habitat.—Northern and Western Brazil.

Preparation.—The seeds are subglobular, 8 to 10 millimeters ($\frac{1}{3}$–$\frac{2}{5}$ inch) in diameter, glossy blackish-brown and with a broad light brown hilum and a whitish embryo. They are roasted, then broken, kneaded with water into a pasty mass, formed into cakes, and dried by artificial and solar heat.

Description.—Subglobular, elliptic, or cylindrical cakes, hard, dark reddish-brown; fracture uneven, lighter colored, showing fragments of the seeds; odor slight, peculiar; taste astringent and bitter; partly soluble in water and alcohol. The powder is light reddish-brown, and contains thick-walled cells and thin-walled parenchyme with pasty starch, starch granules, crystals, oil drops, etc.

Constituents.—Caffeine, $C_8H_{10}N_4O_2$, 4 to 5 per cent., tannin 26 per cent. (coloring ferric salts black-green), starch, mucilage, fat, saponin, resin, volatile oil, ash 2.5 per cent.

Properties.—Mild astringent, tonic, stimulant, nervine. *Dose,* 0.5 to 4 grams (gr. viij–ʒj), in powder, syrup, or fluid extract. The extract (made with diluted alcohol), 0.2 to 1 gram (gr. iij–xv).

OPIUM.—Opium.

Meconium, Thebaicum, Succus thebaicus.

Origin.—Papáver somníferum, *Linné.* *Natural order,* Papaveraceæ, Papavereæ.

Habitat.—Western Asia; cultivated.

Preparation.—The green capsule is scarified transversely by a one-bladed knife (Asia Minor and Egypt), or longitudinally by a several-bladed knife (India, Japan); the white milk-juice assumes a brown color, thickens, and is then scraped off and formed into cakes. In Asia Minor the cakes are wrapped in a poppy leaf and packed with rumex-capsules; this constitutes the officinal opium.

Description.—Subglobular or irregularly angular and flattened cakes, with the remains of poppy leaves and some fruits of a species of rumex adhering to the surface, plastic, and chestnut-brown, or harder, darker, somewhat shining, and with a coarsely granular fracture; internally with some tears and fragments of the epicarp of the poppy capsules; odor heavy narcotic; taste bitter and nauseous.

10 grams of opium—previously dried at a temperature of 105° C. (220° F.), exhausted with cold water, and the solution evaporated to dryness—yield an extract weighing between 5.5 and 6 grams (or between 55 and 60 grains from 100 grains of well-dried opium). Opium should contain about 10 per cent., and powdered opium 12 to 16 per cent., of morphine.

Varieties.—Smyrna, Turkey, or Constantinople opium, described above.

Egyptian opium. Flattish cakes, enveloped in poppy leaf, free from rumex fruit; now rarely exported.

Persian opium. Cylindrical sticks, short cones, or small balls of a rather light brown color; wrapped in paper or oftener packed in poppy trash; oily and of rather firm consistence.

East Indian opium. In globular balls weighing about 1900 grams (nearly 4½ lbs. avoirdupois), and enclosed in a hard shell formed of poppy petals (provision opium); or in flat square or circular cakes wrapped in oiled paper (Abkari opium).

European and American opium, prepared experimentally, but never on a large scale.

Factitious opium has been occasionally met with; it was probably the aqueous extract of the poppy plant, of a blackish-brown color, soft consistence, and deficient in odor and taste.

Adulterations.—Lead balls, shot, pebbles, starch, and gum have been used for the purpose.

Constituents.—Free from starch, tannin, and oxalates. Contains odorous principle, glucose, mucilage, pectin, caoutchouc, wax, fatty matter, coloring principle, ash 6 per cent., meconic acid, $C_7H_4O_7$ (present in free state; ferric salts produce a deep red color, which is not discharged by hydrochloric acid or mercuric chloride), lactic acid 1¼ per cent., meconin, $C_{10}H_{10}O_4$ (bitter, soluble in alcohol and ether), meconoiosin, $C_8H_{10}O_2$ (red, changing to purple when evaporated with slightly diluted sulphuric acid, while meconin turns green), and numerous alkaloids, mostly present as sulphates.

Narcotine, $C_{22}H_{23}NO_7$, 1.3 to 10 per cent. Soluble in ether, benzol, chloroform and boiling alkali solutions;

melts at 176° C. (349° F.); dissolves blood-red in sulphuric acid containing some nitric acid, and with orange carmine and dingy violet colors in hot sulphuric acid; Fröhde's reagent colors green, brown, yellow, and reddish; heated with nitric acid yields opianic acid, meconin, and cotarnine, $C_{12}H_{13}NO_3$, a stronger base.

Morphine, $C_{17}H_{19}NO_3.H_2O$, 2.5 to 15 or 22.8 per cent. Nearly insoluble in ether, chloroform, and benzol, soluble in alkalies; blood-red, orange, then yellow with nitric acid; orange-colored by chlorinated alkalies; deep blue by ferric chloride, the color disappearing on heating or on the addition of acids; liberates iodine from iodic acid; Fröhde's reagent colors violet, brown, and greenish; heated with hydrochloric acid under pressure yields apomorphine, $C_{17}H_{17}NO_2$, which is emetic, and in moist air turns green.

Codeine, $C_{18}H_{21}NO_3$, 0.2 to 0.7 per cent. Soluble in ether, chloroform, benzol, and water; melts in hot water; crystallized from anhydrous ether melts at 153° C. (307.4° F.); colored yellow by nitric acid; blue by sulphuric containing a trace of nitric acid or ferric salt. It is the methyl ether of morphine, $C_{17}H_{18}NO_2.OCH_3$.

Pseudomorphine, phormine or oxydimorphine, $C_{34}H_{36}N_2O_6$, 0.2 per cent. Insoluble in ether and chloroform; red by nitric acid, and blue by ferric chloride; tasteless, not poisonous.

Thebaine (paramorphine), $C_{19}H_{21}NO_3$, 0.15 to 1 per cent. Soluble in ether, chloroform, and benzol; somewhat soluble in alkalies; colored red and yellow by sulphuric acid; yellow by nitric acid; easily decomposed by mineral acids.

Narceine, $C_{23}H_{29}NO_9$, 0.02 to 0.1 or 0.7 per cent. Insoluble in ether and benzol; freely soluble in boiling water and alcohol; sparingly so in chloroform; colored violet and cherry-red by warm dilute sulphuric acid; transiently yellow by nitric acid; blue by a little iodine; brown and yellow by Fröhde's reagent.

Papaverine, $C_{21}H_{21}NO_4$, 1 per cent. Soluble in chloroform and benzol; slightly soluble in ether; melting point 147° C. (297° F.); violet-blue by warm sulphuric acid, changing to green with a nitrate; Fröhde's reagent colors violet, blue, and yellowish.

Rhœadine, $C_{21}H_{21}NO_6$. Nearly insoluble in simple solvents; solutions in dilute acids tasteless and colorless, turning purple by sulphuric acid.

Cryptopine, $C_{21}H_{23}NO_5$. Freely soluble in chloroform, sparingly soluble in other simple solvents; melting point 217° C. (422.6 F.); salts gelatinize from hot water; blue by sulphuric acid, changing to orange-yellow by a nitrate.

Gnoscopine, $C_{34}H_{36}N_2O_{11}$. Soluble in chloroform, carbon disulphide, and benzol; carmine-red by sulphuric containing nitric acid.

Oxynarcotine, $C_{22}H_{23}NO_8$. Soluble in alkalies; sparingly so in alcohol; insoluble in ether, chloroform, and benzol; on oxidation yields cotarnine and hemipic acid.

Lanthopine, $C_{23}H_{25}NO_4$. Readily soluble in chloroform; melts near 200° C. (392° F.); orange-red by nitric acid; pale violet color by sulphuric acid, dark brown on heating.

Meconidine, $C_{21}H_{23}NO_4$. Amorphous; readily soluble in ether, benzol, and chloroform; melts at 58.6° C. (136.4° F.); olive-green by sulphuric acid; orange-red by nitric acid.

Laudanine, $C_{20}H_{25}NO_4$. Sparingly soluble in cold alcohol or ether, soluble in chloroform and benzol; melts at 166° C. (331° F.); rose-red by sulphuric acid containing ferric salt, violet on heating; orange-red by nitric acid; emerald green with ferric chloride; the salts bitter.

Codamine, $C_{20}H_{25}NO_4$. Readily soluble in simple solvents; melting point 121° C. (250° F.); blue with sulphuric acid containing ferric salt, on heating green and dark violet; dark green by nitric acid or ferric chloride; salts amorphous.

Deuteropine, $C_{20}H_{21}NO_5$. Not known in pure state.

Laudanosine, $C_{21}H_{27}NO_4$. Soluble in ether, chloroform, and benzol; melts at 89° C. (192.2° F.); colored yellow by light; brown-red by sulphuric acid containing ferric salt, changed to green and dark violet on heating.

Protopine, $C_{20}H_{19}NO_5$. Slightly soluble in ether, benzol, and alcohol; more soluble in chloroform; melting point 202° C.; crude H_2SO_4 colors deep violet.

Hydrocotarnine, $C_{12}H_{15}NO_3$. Soluble in ether, chloroform, and benzol; melts at 50° C. (122° F.); hot H_2SO_4 colors red; on oxidation yields cotarnine.

The last twelve alkaloids are present only in minute quantities.

Properties.—Narcotic, sedative, anodyne, antispasmodic, hypnotic, chiefly due to the morphine present. Narcotine is antiperiodic and tetanizing, in doses of 1 to 2 grams (gr. xv–xxx) hypnotic; of similar action is hydro-cotarnine. Codeine is hypnotic, in large doses tetanic, used in diabetes. Thebaine is soporific, excitant, and tetanizing. Narceine is feebly hypnotic. Papaverine and cryptopine are hypnotic and sedative. Laudanine and laudanosine have a tetanizing action. *Dose*, opium 0.06 to 0.13 gram (gr j–ij) or more. Morphine 0.01 to 0.03 gram (gr. $\frac{1}{6}$–ss) or more.

Antidotes.—Evacuation preferably by mechanical means, (stomach-pump, etc.); ambulatory treatment; stimulants (strong coffee, brandy, etc.); cold douches; atropine.

LACTUCARIUM.—LACTUCARIUM.

Origin.—Lactúca virósa, *Linné*, L. satíva, *Linné*, and L. Scaríola, *Linné*. *Natural order*, Compositæ, Cichoriaceæ.

Habitat.—Southern and Central Europe; the second species extensively cultivated (garden lettuce); the third species naturalized in some parts of North America.

Preparation.—The top of the flowering stalk is cut off, and the milk-juice scraped into earthen vessels to harden.

Description.—In sections of plano-convex circular cakes, or in irregular angular pieces; externally gray-brown or dull reddish-brown; internally whitish or yellowish, of a waxy lustre; odor narcotic; taste bitter.

It is partly soluble in alcohol and ether, is softened by hot water, and, when triturated with water, yields a turbid mixture. Diluted alcohol dissolves between 36 and 44 per cent. of the lactucarium. Spirit of chloroform dissolves between 55 and 60 per cent., chiefly lactucon.

Lactúca canadénsis, *Linné*, at the time of flowering, yields a good lactucarium; earlier in the season its milk-juice is not bitter, or but slightly so.

Constituents.—Lactucin, $C_{11}H_{12}O_3.H_2O$ (bitter scales soluble in 60 parts of cold water, insoluble in ether; turns red and brown by alkalies, and loses its bitter taste), lactucic acid (crystalline, bitter, red by alkalies), lactucopicrin (amorphous, bitter), lactucerin or lactucon about 50 per cent. (tasteless needles; composition variable), caoutchouc, resin, sugar, mucilage, asparagin, trace of volatile oil, ash 7 to 10 per cent., etc.

Properties.—Anodyne, hypnotic, sedative. *Dose*, 0.1 to 0.3 or 0.5 gram (gr. jss–v–viij), in syrup or fluid extract.

Thridace or French lactucarium is not the milk-juice, but the extract of the herb.

ALOE.—ALOES.

Origin.—1. A'loe socotrína, *Lamarck.* 2. A. vulgáris, *Lamarck.* 3. A. férox, *Miller*, and other species of Aloe. *Natural order*, Liliaceæ, Aloeineæ.

Habitat.—1. Eastern Africa (A′loe Pérryi, *Baker*, in the island of Socotra). 2. India and Northeastern Africa; naturalized in the West Indies. 3. Southern Africa, where A. spicáta, *Thunberg*, and 6 or 8 additional species and hybrids are used in the preparation of aloes.

Preparation.—The leaves are cut off and the juice exuding from them is collected without using any pressure, after which it is evaporated.

Description.—Of different shades of brown, opaque, and in thin layers translucent or transparent; fracture somewhat conchoidal, dull waxy or glossy resinous; odor peculiar, when breathed upon saffron-like; taste bitter, nauseous. Aloes is almost completely soluble in alcohol, in boiling water, and in alkalies; nearly insoluble in ether, chloroform, benzol, benzin, and carbon disulphide.

Varieties.—Aloe socotrina; Socotrine aloes. Hard, or the interior occasionally soft, opaque, yellowish-brown or orange-brown, not greenish, translucent; odor rather pleasant. Mixed with alcohol, and examined under the microscope, it exhibits numerous crystals. It is exported from Zanzibar and other places of Eastern Africa, frequently *via* Bombay.

A′loe barbadénse; Barbadoes aloes. Deep orange-brown, opaque, translucent; odor differing somewhat from that of the preceding; under the microscope crystalline. It is exported from the island of Barbadoes. Bonare and Curaçao aloes, also derived from Aloe vulgaris, are more glossy.

A′loe capénsis; Cape aloes. Blackish-brown or olive-black, transparent and red-brown on the edges, glossy; odor unpleasant; not crystalline under the microscope.

Natal aloes. Light yellowish-gray-brown, dull, and opaque; odor and taste weaker than in the other varieties; crystalline under the microscope; medicinally of little value. The plant yielding it is unknown; it is exported from Port Natal.

Moka aloes. Brown-black, opaque, impure, and of disagreeable odor; from the interior of Arabia.

Caballine aloes; Horse aloes. Dark colored, opaque, and fetid.

Constituents.—Volatile oil a minute quantity, ash about 1 per cent., aloin and so-called resin. The latter amounts to about 60 per cent., is soluble in hot water, and almost wholly reprecipitated on boiling; soluble in alcohol and colored brown-black by ferric salts. The crystalline aloin is yellow or pale yellow, and not freely soluble in simple solvents. Cape aloes does not yield aloin.

Socaloin or zanaloin, $C_{15}H_{16}O_7$, is little affected by cold nitric acid.

Nataloin, $C_{16}H_{18}O_7$, is colored crimson by cold nitric acid. If added to cold sulphuric acid, and the vapor of nitric acid passed over it, the orange color will rapidly change to green, red, and blue; the other aloins are little affected by this test. Oxidation with HNO_3 yields picric and oxalic acids.

Barbaloin, $C_{17}H_{20}O_7$, is colored crimson by cold nitric acid. Yields like socaloin, on oxidation with HNO_3, chrysammic, aloetic, picric, and oxalic acids.

Properties.—Laxative, drastic, emmenagogue, vermifuge. *Dose*, 0.12 to 0.3 or 0.5 to 1 gram (gr. ij–v or viij–xv), in pills, tincture, wine, enema, or suppository.

CURARA.—CURARE.

Origin.—Stry′chnos Castelnæána, *Weddell*, Str. toxífera, *Schomburgk*, and other species of Strychnos. *Natural order*, Loganiaceæ, Euloganieæ.

Habitat.—Brazil and Guiana.

Preparation.—An infusion or decoction is made from the bark with the addition of various other substances; afterward evaporated.

Description. — Blackish-brown, extract-like, and hygroscopic, or firmer, brittle, and friable; about 75 per cent. soluble in cold water.

Constituents.—Curarine, $NC_{18}H_{35}$, resin, fat, gum, inorganic matters. Curarine is crystalline, very bitter, hygroscopic, sparingly soluble in ether and chloroform, and is colored dark red by nitric acid; sulphuric acids colors carmine-red, becoming violet with potassium chromate.

Properties.—Diaphoretic, nervous sedative, irritant. *Dose,* 0.006 to 0.02 gram (gr. $\frac{1}{10}$–$\frac{1}{3}$).

EXTRACTUM GLYCYRRHIZÆ.—Liquorice. Licorice.

Succus liquiritiæ.

Origin.—Glycyrrhíza glábra, *Linné.* *Natural order,* Leguminosæ, Papilionaceæ, Galegeæ.

Habitat.—Southern Europe; cultivated.

Preparation.—The bruised root is boiled with water, expressed, the liquid evaporated, and the stiff extract while warm rolled out into sticks.

Description.—Cylindrical brown-black sticks of varying dimensions, somewhat flexible when warm, breaking with a glossy and flat conchoidal fracture, and yielding a brown powder; odor slight; taste sweet, somewhat acrid.

Licorice loses on drying from 10 to 15 per cent. of moisture, and if now treated with cold water, yields to it from 60 to 70 per cent. of its weight, and subsequently an additional quantity to dilute ammonia.

Constituents.—Glycyrrhizin, free and combined with bases, the former soluble in ammonia; glucose, pasty starch, fragments of tissue, ash 6 to 8 per cent.

Adulteration.—Dextrin and gum are precipitated from the aqueous infusion by alcohol; glucose is not precipitated.

Properties.—Demulcent, expectorant. *Dose,* 1 to 2 grams (gr. xv–xxx); used for correcting the taste of bitter medicines.

CATECHU.—CATECHU. CUTCH.

Origin.—Acácia Cátechu, *Willdenow,* and Ac. Súma, *Kurz. Natural order,* Leguminosæ, Mimoseæ, Acacieæ.

Habitat.—India; the second species also in Eastern Africa.

Preparation.—The brown heartwood is boiled with water, and the concentrated decoction poured upon mats of leaves or into moulds.

Description.—In irregular masses, containing fragments of leaves, dark brown, glossy, brittle, breaking with a conchoidal fracture, often somewhat porous in the interior; the powder of a red-brown color; nearly inodorous; taste strongly astringent and sweetish; partly soluble in cold water, the solution having an acid reaction, and the undissolved portion containing numerous acicular crystals; yields with hot water a dark brown turbid liquid; hot alcohol leaves not over 15 per cent. undissolved; the tincture diluted is turned green by ferric salts.

Constituents.—Catechutannic acid, about 35 per cent. (brown, insoluble in ether, black-green with ferric salts), catechin, $C_{18}H_{18}O_8$ (white needles, sparingly soluble in cold water, soluble in ether, sweetish, green with ferric salts, precipitated by albumen, but not by gelatin; melting-point 217° C., on dry distillation yields pyrocatechin, phenol, and acetic acid), catechu red, little quercetin, gum, ash 0.6 to 6 per cent. Catechin, fused with potassa, yields phloroglucin and protocatechuic acid, $C_7H_6O_4$ (Fe_2Cl_6 colors the solution dark green, changing by alkali carbonate to blue and red). Pyrocatechin or catechol has the formula $C_6H_6O_2$; Fe_2Cl_6 colors it dark green, changing by ammonia, etc., to violet.

Properties.—Tonic, astringent. *Dose,* 0.5 to 2 grams (gr. viij–xxx), in powder, pills, troches, or tincture.

CATECHU PALLIDUM.—GAMBIR.

Pale Catechu. Terra japonica.

Origin.—Uncária (Naúclea, *Hunter*) Gámbir, *Roxburgh.* *Natural order,* Rubiaceæ, Naucleæ.

Habitat.—East India Islands.

Preparation.—The leaves and young shoots are boiled in water and the decoction is evaporated.

Description.—Irregular masses or cubes about 25 millimeters (1 inch) square; externally reddish brown, internally pale brown-gray or light cinnamon-brown; fracture dull earthy, under the microscope crystalline, friable, inodorous, bitterish, astringent, and sweetish; slightly soluble in cold water.

Constituents.—Catechin (predominating in the pale colored varieties), catechutannin, quercetin, ash 2 to 5 per cent. Three catechins have been isolated, differing in melting-points and in composition, also from that of catechu.

Properties.—Tonic, astringent. *Dose,* 0.5 to 2 grams (gr. viij–xxx), in powder, pills, troches, or tincture.

KINO.—KINO.

Origin.—Pterocárpus Marsúpium, *Roxburgh.* *Natural order,* Leguminosæ, Papilionaceæ, Dalbergieæ.

Habitat.—East Indies.

Preparation.—Incisions are made into the trunk of the tree and the exuding red juice is inspissated without the use of artificial heat.

Description.—Small, angular, dark brown-red, shining pieces, brittle, in thin layers ruby-red and transparent; not crystalline; the powder of a red color; inodorous, very astringent, and sweetish; when masticated, becomes adhesive to the teeth and tinges the saliva deep red; soluble in alcohol and in alkalies, mostly soluble in cold water, nearly insoluble in ether; separates gelatinous from hot water.

Constituents.—Kinotannic acid (black-green by ferric salts; in neutral solution violet by ferrous salts); kino-red (tasteless, nearly insoluble in water), pyrocatechin or catechol (trace, soluble in ether and water), kinoin (colorless prisms, soluble in ether; slightly soluble in cold water; by ferric chloride red; at 125° C. converted into kino-red), ash 1.3 per cent.

Varieties.—Malabar kino, described above.

Bengal or Palas kino, from Bútea frondósa, *Roxburgh*, Papilionaceæ, Phaseoleæ. Blackish-red, in transparent light ruby-red tears or fragments, often with impressions of leaf-veins, brittle, not adhesive on mastication.

Gambia kino, from Pterocárpus erináceus, *Poiret*, is now not an article of commerce.

Australian or Botany Bay kino, from Eucaly′ptus amygdalína, *Labillardière*, and other species of Eucalyptus, Myrtaceæ; varying in solubility and composition; some varieties contain much gum. Ceratopétalum gummíferum and C. apétalum, *Smith* (Saxifragaceæ), also yield kino-like exudations, that of the last species containing coumarin.

West Indian kino, from Coccóloba uvífera, *Linné*, Polygonaceæ. Dark brown-red, almost wholly soluble in water and alcohol; taste astringent and bitterish.

Properties.—Tonic, astringent. *Dose*, 0.5 to 2 grams (gr. viij–xxx), in powder, pills, troches, or tincture.

MONESIA.—MONESIA.

Origin.—Lucúma glycyphlæ′a, *Martius et Eichler* (Chrysophy′llum glyciphœ′um, *Casaretti*). *Natural order*, Sapotaceæ.

Habitat.—Brazil.

Preparation.—By boiling the bark in water and evaporating.

Description.—Black-brown cakes or angular fragments, soluble in water, inodorous; taste sweet, astringent, and acrid.

Constituents.—Tannin 62 per cent. (blue-black by ferric salts); sweet principle (resembling glycyrrhizin, but not precipitated by acids), monesin (resembling saponin, acrid, foaming in aqueous solution), pectin, coloring matter, ash 3 per cent.

Properties.—Stimulant, tonic, astringent. *Dose,* 0.3 to 1.5 grams (gr. v–xxij), in powder, tincture, and syrup.

Substitutions.—The astringent extracts described above have been sold in place of it; also

Extractum Hæmatoxyli, extract of logwood, which is red-brown, not acrid, and yields with water a red solution.

GUTTA PERCHA.—GUTTA PERCHA.

Origin.—Paláquium oblongifólium, *Burck,* and several allied species. *Natural order,* Sapotaceæ, Eusapoteæ.

Habitat.—Malay peninsula and islands. Isonándra (Dichópsis, Paláquium) Gútta, *Hooker,* is said to be nearly extinct.

Collection.—The trees are felled, and the bark is incised or strips of it are removed; the milky juice is collected, allowed to harden, then softened in hot water, and freed from pieces of wood and bark.

Properties.—Grayish or yellowish masses, often with red-brown streaks, hard, heavier than water if free from cavities; rather horny, somewhat flexible, but scarcely elastic; spec. grav. about 0.98; plastic above 50° C. (122° F.), very soft at the temperature of boiling water; decomposed on melting; nearly inodorous and tasteless; insoluble in water, cold alcohol, alkalies, and dilute acids; soluble in ether, benzol, chloroform, oil of turpentine, and carbon disulphide.

Balata, chicle or tuno gum from Mímusops globósa, *Gaertner* (Sapóta Múlleri, *Belkrode*), the Central America bully tree, closely resembles gutta percha in appearance and properties.

Constituents.—Gutta, $C_{20}H_{32}$, about 80 per cent. (white fine powder), a yellow resin, fluavil, $C_{20}H_{32}O$, and a white crystalline resin, albane, $C_{20}H_{32}O_2$; the last two separate on cooling from hot alcohol. Ash 3 or 4 per cent.

Uses.—As an adhesive and protective agent for wounds and abrasions, and for the preparation of bougies, pessaries, and caustic pencils.

ELASTICA. RESINA ELASTICA.—CAOUTCHOUC. INDIA RUBBER.

Origin.—In the milk juices of many plants; prepared chiefly from trees of the natural order of Euphorbiaceæ (Siphonia, Hevea, Jatropha, etc.), Apocynaceæ (Urceola, Vahea, Landolphia, etc.), and Artocarpaceæ (Ficus, Urostigma, Castilloa, etc.); these grow in tropical countries.

Preparation.—Incisions are made, and the milk-juice is allowed to congeal in mass, or it is dried over clay or wooden moulds with or without the aid of artificial heat.

Description.—In cakes, balls, or hollow bottle-shaped pieces, externally blackish-brown, internally brownish; spec. grav. about 0.96; very elastic; odor slight, peculiar, nearly tasteless; soluble in carbon disulphide, chloroform, benzol, and oil of turpentine. It melts at about 125° C. (257° F.), and after cooling, remains soft and adhesive; on dry distillation it yields caoutchoucin, containing caoutchin, $C_{10}H_{16}$, isoprene, C_5H_8 and other hydrocarbons.

Constituents.—Crude caoutchouc contains some fat, volatile oil, albumin, and coloring matters; but the principal constituent is a colorless solid hydrocarbon, $C_{20}H_{32}$. On combining it with about 10 per cent. of sulphur, vulcanized rubber is obtained; and on incorporating half its weight of sulphur and hardening by pressure, vulcanite or ebonite is produced.

Uses.—For plasters, bougies, pessaries, syringes, etc.

2. SUGARS.—SACCHARA.

Sugars have a sweet taste, are soluble in water and diluted alcohol, and insoluble in ether.

Classification.

Sect. 1. Solid sugars.	
Crystalline; not fermentable; does not reduce cupric oxide.	Saccharum.
Fermentable; reduces cupric to cuprous oxide; often contains dextrin.	Saccharum uveum.
contains mucilage and mannit.	Manna.
White, gritty, not forming a syrup.	Saccharum lactis.
Sect. 2. Liquid sugars.	
Brown, somewhat empyreumatic.	Syrupus fuscus.
Brownish, aromatic; gradually becomes granular.	Mel.

SACCHARUM.—SUGAR. CANE SUGAR.

Saccharose, Sucrose.

Origin.—Sáccharum officinárum, *Linné. Natural order*, Gramineæ, Andropogoneæ.

Habitat.—Southern Asia; cultivated in tropical and subtropical countries.

Preparation.—Sugar cane yields by expression about 80 per cent. of juice, containing about 80 per cent. of water and 18 per cent. of sugar. The juice is evaporated, the residue granulated, the treacle or molasses drained off, and the raw sugar refined by dissolving in water, heating with blood or albumen, filtering through animal charcoal, and concentrating in a vacuum pan, until, after cooling, it congeals to a crystalline mass, from which the mother liquor is washed out by percolation with water or sugar solution. Sugar is also prepared from the sugar-beet (Béta vulgáris, *Linné*), (Chenopodiaceæ), which contains about 14 per cent. of it.

Description.—White crystalline pieces of transparent granules, of spec. grav. 1.59, not hygroscopic, inodorous, very sweet; fusible at 160° C. (320° F.); soluble in half its weight of cold water, forming a colorless slightly dextrogyre syrup; sparingly soluble in strong alcohol; insoluble in ether. In contact with ferments contained in the air, or on boiling with dilute acids, its aqueous solution is converted into invert sugar (mixture of glucose and lævulose), is then directly fermentable, and reduces red cuprous oxide from an alkaline solution of cupric oxide. If kept for some time at 180° C. sugar is converted, without loss of weight, into a mixture of levulosane, $C_6H_{10}O_5$, and dextrose (glucose), $C_6H_{12}O_6$.

Composition.—$C_{12}H_{22}O_{11}$.

Adulterations.—Inferior sugars are whitened with ultramarine or Prussian blue.

Derivatives.—Saccharum crystallisatum, rock candy, is cane sugar in large crystals.

Saccharum hordeatum, barely sugar, is cane sugar carefully melted and cooled; it is amorphous, transparent, and gradually becomes crystalline and opaque upon the surface.

Caramel. Cane sugar is heated to about 200° C. (392° F.), the conversion is hastened by alkalies. Dark brown of a bitter taste; consists of colorless bitter caramelan $C_{12}H_{18}O_9$, red-brown caramelene, and other compounds; used for coloring liquors.

Properties.—Demulcent, lenitive; externally in certain ulcerations.

SACCHARUM UVEUM.—Grape Sugar.

Saccharum amylaceum. Starch sugar. Glucose. Dextrose.

Origin and Preparation.—Starch is boiled for a considerable time with dilute sulphuric acid, the free acid removed by calcium carbonate, and the filtered solution evaporated.

Description.—Whitish or yellowish masses or irregular granules, crystallizes with and without water, inodorous, sweet (less so than cane sugar), soluble in about one part of cold water, but in all proportions in hot water; sparingly soluble in strong alcohol, insoluble in ether; melts near 85° C. (185° F.), the anhydrous crystals at 144° C. (291° F.). Ordinarily, commercial grape sugar contains about 60 per cent. of glucose, 20 per cent. of dextrin and allied substances, and 20 per cent. of water with 0.3 ash. The cold aqueous solution rotates to the right; mixed with twice its bulk of alcohol, it yields a whitish precipitate if dextrin is present, and a white precipitate with ammonium oxalate from the presence of calcium sulphate. Commercial liquid grape sugar is called glucose, and contains much dextrin. The dilute solution in water is readily fermentable, is colored brown when heated with potassa, speedily reduces red cuprous oxide from an alkaline solution of cupric oxide, and separates a metallic mirror from an ammoniacal solution of silver.

Composition.—$C_6H_{12}O_6.H_2O$; on heating it caramel is obtained.

Properties.—Similar to cane sugar.

MA'NNA.—Manna.

Origin.—Fràxinus O'rnus, *Linné*, s. O'rnus europæ'a, *Persoon*. *Natural order*, Oleaceæ, Oleineæ.

Habitat.—Basin of the Mediterranean.

Collection.—In Sicily transverse incisions are made through the bark, and the exuding juice is allowed to harden on the trunk of the tree or on tiles.

Description.—Flattish three-edged pieces occasionally 20 centimeters (8 inches) long, and 5 centimeters (2 inches) broad, usually smaller pieces and irregular fragments; friable, externally yellowish-white, internally white, porous, and crystalline. Or in brownish-white fragments of different size, somewhat glutinous on the surface, internally white and crystalline. Odor honey-like; taste sweet, slightly bitter, and faintly acrid; soluble in water and alcohol, except fragments of bark and similar impurities.

Manna consisting of brownish viscid masses which contain few or no fragments having a crystalline structure, should be rejected.

Varieties.—Large flake manna; the larger yellowish-white pieces.

Small flake manna; smaller pieces, occasionally of a brownish hue.

Manna in sorts; minute tears or small glutinous fragments, internally crystalline.

Fat manna; brownish viscid masses, without crystalline fragments.

Constituents.—Mannit 90 per cent. in the best varieties, glucose, mucilage, resin, fraxin, $C_{32}H_{36}O_{20}$. Mannit, $C_6H_8(OH)_6$, crystallizes in white prisms, dissolves in 6.5 parts of cold water, and sparingly in strong alcohol; on careful oxidation yields fermentable mannitose and various acids The amount of glucose and mucilage is largest in the inferior kinds of manna, which also contain a larger portion of fraxin, to which the fluorescence of the aqueous solution is due.

The following mannas are not met with in commerce: Briançon from Lárix europæ'a, *De Candolle*, (Coniferæ); Armenian from Quércus vallónea, *Kotschy* (Cupuliferæ); Persian from Alhági camelórum, *Fischer* (Papilionaceæ, Hedysareæ); Australian from Eucaly'ptus mannífera, *Mudie*, and E. viminális, *Labillardière* (Myrtaceæ); lerp produced in Tasmania upon Eucaly'ptus dumósa, *Cunningham;* trehala, the cocoon of Larínus mellíficus, *Jeckel* (Coleoptera), and others.

Properties.—Demulcent, laxative. *Dose*, 4 to 32 grams (ʒj–℥j), in solution, syrup, or as addition to other medicines.

SACCHARUM LACTIS.—MILK SUGAR.

Lactose, Lactin.

Origin.—The milk of mammals, especially of Bos Taúrus, *Linné*; *order* Ruminantia, *family* Bovidæ.

Preparation.—After the removal of the butter and casein from cow's milk, the whey is concentrated and allowed to crystallize upon sticks or cords.

Description. — Hard whitish translucent four-sided prisms, usually aggregated into cylindrical masses; spec. grav. 1.525; becomes anhydrous at 130° C. (266° F.), and melts at 203.5° C. (398° F.); soluble in 6 parts of cold water without forming a syrupy solution, insoluble in strong alcohol and in ether; inodorous; of a sandy and sweetish taste.

The solution in water boiled with potassa turns yellowish-brown, slowly reduces cuprous oxide from alkaline solutions of cupric oxide, and deposits a metallic mirror from an ammoniacal solution of silver. On boiling milk sugar with lead acetate, and adding ammonia, a red precipitate is formed.

Composition.—$C_{12}H_{22}O_{11}.H_2O$; on boiling with dilute acids splits into dextrose (see page 441) and gálactose $C_6H_{12}O_6$ (melting-point 145° C. = 293° F.); on heating caramel is obtained.

Properties. — Demulcent, laxative; chiefly used as a vehicle.

SYRUPUS FUSCUS.—MOLASSES.

Sacchari fæx, Theriaca, Treacle.

Origin.—Obtained in the manufacture and refining of sugar.

Description.—Syrupy liquid of various shades of brown, clear or nearly clear, spec. grav. about 1.40; reaction slightly acid; odor slightly empyreumatic; taste very sweet; is not precipitated by an equal bulk of alcohol.

Varieties.—West India and sugar-house molasses; the former has a lighter color and somewhat different odor.

Properties.—Like sugar.

MEL.—HONEY.

Origin and Preparation.—Honey is deposited in the honeycomb by the bee, A′pis mellífica, *Linné*. *Class*, Insecta. *Order*, Hymenoptera. It is obtained either by draining or by melting the honeycomb.

Description.—Syrupy, of spec. grav. 1.38 to 1.40; light yellowish or pale brownish-yellow, translucent, gradually becoming crystalline and opaque, the specific gravity increasing to about 1.43; polarization slightly to the left, or occasionally slightly to the right; reaction slightly acid; odor agreeably aromatic; taste sweet, mildly aromatic and faintly acrid.

Boiled with water and allowed to cool, it does not become blue on the addition of compound solution of iodine; and when diluted with one part of water, and the solution mixed with an equal bulk of alcohol, no precipitate, or but a very slight one, is produced. The solution of pure honey is but faintly rendered turbid by silver nitrate and barium nitrate. Adulteration with glucose may be determined by polarization; and with cane sugar by the difference in the effect of Fehling's solution before and after the inversion with a mineral acid.

Constituents.—Grape sugar or dextrose (becomes crystalline), fruit sugar or levulose (remains liquid), little wax, proteids, volatile oil, coloring matter, mucilage, and a minute quantity of formic acid; ash 0.1 to 0.3 per cent.

Crude honey usually contains pollen grains in suspension.

Properties.—Demulcent, laxative; externally as a mild stimulant.

3. GUMS.—GUMMATA.

Gums have an insipid taste, are insoluble in alcohol and ether, but dissolve in water, forming a mucilaginous liquid, or form with water a jelly-like adhesive mass.

Classification.

Soluble in water; distinct tears, transparent, but fissured internally.	Acacia.
Swelling in water; curved bands, translucent, composed of several layers.	Tragacantha.

ACACIA.—Gum Arabic.

Origin.—Acácia Sénegal, *Willdenow,* s. A. Vérek, *Guillemin et Perottet,* and other species of Acacia. *Natural order*, Leguminosæ, Mimoseæ, Acacieæ.

Habitat.—Eastern Africa, principally Kordofan; Western Africa near the river Senegal.

Production.—The gum exudes spontaneously and from incisions made into the bark.

Description.—Roundish brittle tears of various sizes, or broken into angular fragments, with a glass-like, sometimes iridescent fracture, opaque from numerous fissures, but transparent and nearly colorless in thin pieces; spec. grav. 1.49; nearly inodorous; taste insipid, mucilaginous; insoluble in alcohol; soluble in water, forming a thick mucilaginous liquid. This solution has an acid reaction to test-paper, yields gelatinous precipitates with subacetate of lead, ferric chloride, and concentrated solution of borax, is rendered turbid by oxalates, and is not colored blue by iodine.

Varieties. — Kordofan gum, the best kind, described above.

Senaar gum, nearly equal to the preceding, is produced by Acácia fístula, *Schweinfurth*, and A. stenocárpa, *Hochstetter*.

Savakin (Suakin) gum, of handsome appearance, very brittle; does not completely dissolve in water except after the addition of a little alkali.

Senegal gum. The tears are often larger, color more yellow or reddish; fissures fewer in number, therefore more transparent and less brittle; taste sometimes bitterish; usually collected with African bdellium.

East India gum was formerly produced from Eastern Africa, and shipped by way of Bombay. In recent years much gum of Indian origin from various sources has been sent to market, varying from colorless to yellow and red-brown. The following gums are completely soluble in water: Acácia Cátechu, *Willdenow;* Pithecolóbium dúlce, *Bentham;* Prosópis spicígera, *Willdenow;* Mélia Azadiráchta, *Linné;* Swieténia Mahogáni, *Linné;* and Ferrónia elephántum, *Correa;* the last four gums are not gelatinized by borax. The gum of Anogeíssus latifólia, *Wallich,* is not gelatinized by ferric chloride.

Mezquit gum from Prosópis (Algaróbia) julifióra, *De Candolle,* s. P. glandulósa, *Gray,* in Western Texas and Mexico; resembles gum Arabic, but is mostly yellow or red-brown; its solution in water is not precipitated by subacetate of lead, ferric chloride, or borax.

Considerable gum is also produced from different species of Acacia in Morocco, the Cape Colony, and Australia.

Composition.—Arabic acid, $C_{12}H_{22}O_{11}$, combined with calcium, magnesium, and potassium; moisture about 14 per cent.; trace of sugar; ash 3 to 4 per cent. Arabic or gummic acid, after drying, swells with water, but does not dissolve in it, except after the addition of an alkali (Savakin gum); on boiling with acids yields arabinose (crystallizes in prisms; sweet; not directly fermentable), possibly also galactose (granular, less sweet).

Properties.—Demulcent.

TRAGACANTHA.—TRAGACANTH.

Origin.—Astrágalus gúmmifer, *Labillardière*, and other species of Astragalus. *Natural order*, Leguminosæ, Papilionaceæ, Galegeæ.

Habitat.—Western Asia.

Production.—The tissue of the pith and medullary rays is gradually altered to a compound swelling with water, and in this condition exuding spontaneously and from incisions into the stem of the shrubs.

Description.—Narrow or broad bands, more or less curved or contorted, marked by parallel wavy lines or ridges; white or faintly yellowish, translucent, horn-like, tough, rendered more pulverizable by a heat 50° C. (122° F.); inodorous; taste insipid, sometimes faintly bitterish. It swells with water into a gelatinous mass which is tinged blue by iodine, and the fluid portion of which is precipitated by alcohol and lead acetate, but not disturbed by ferric chloride and borax.

Varieties.—Flake tragacanth, the bands described above.

Vermiform tragacanth; very narrow bands or strings, variously coiled.

Tragacanth in sorts. Stratified or nodular, conical, and subglobular pieces, more or less brown, often adulterated with the gum of the almond and plum trees.

Constituents.—Traganthin or bassorin, $C_6H_{10}O_5$, and the calcium compound of a gummic acid, not identical with arabic acid; starch, fragments of cells, moisture 14 per cent., ash 3 per cent.

Properties.—Demulcent.

4. GUM-RESINS.—GUMMI-RESINÆ.

Gum resins are milky exudations of plants and consist of gum which is wholly or partly soluble in water, and resin which is soluble in alcohol. Many gum-resins contain also volatile oil. Fragments of vegetable tissue, small fruits, or seeds are occasionally met with in the commercial gum-resins, all of which yield emulsions on being triturated with water.

Classification.

Sect. 1. Gum-resins containing volatile oil.

Tears internally white, turning red on exposure, imbedded in a brown sticky mass.	Asafœtida.
Tears small, internally whitish, superficially adhesive; occasionally brownish, semifluid.	Galbanum.
Tears few, imbedded in a brown sticky mass; emulsion brown; odor garlic-like	Sagapenum.
Tears brownish-yellow, internally milk-white, distinct, or superficially adhering.	Ammoniacum.
Tears or masses, dull reddish-brown.	Opopanax.
Tears yellowish, translucent	Olibanum.
Tears or masses, reddish-brown, translucent; fracture waxy.	Myrrha.
Resembling myrrh; but tincture not colored purple by nitric acid.	Bdellium.

Sect. 2. Gum-resins free from volatile oil.

Pipes or cakes; bright orange-yellow.	Cambogia.
Tears frequently hollow; light brown-yellow.	Euphorbium.
Cakes greenish-black or grayish; internally porous; odor cheese-like.	Scammonium.

ASAFŒTIDA.—Asafetida.

Origin.—1. Férula Nárthex, *Boissier* (Nárthex Asafœ′tida, *Falconer*). 2. Férula Asafœ′tida, *Regel.* 3. Férula fœ′tida, *Regel* (Scorodósma fœ′tidum, *Bunge*). *Natural order,* Umbelliferæ, Peucedaneæ.

Habitat.—1. Western Thibet and probably Kashmir. 2, 3. Persia, Turkestan, and Afghanistan.

Collection.—The top of the large root is laid bare, thin slices are cut off, and the exuding milk-juice is scraped off.

Description.—In irregular masses composed of whitish tears, imbedded in a yellowish-gray or brown-gray sticky mass. The tears when hard break with a conchoidal fracture, having a milk-white color which turns gradually to pink and finally to brown. The sticky mass always contains vegetable fragments and earthy impurities (calcium sulphate, etc.). The odor is alliaceous; the taste bitter, acrid, and alliaceous. It is partly soluble in ether and in alcohol, and yields with water a milk-white emulsion, which becomes yellow on the addition of ammonia. Good asafetida yields to alcohol about 60 per cent. of soluble matter. Moistened with alcohol, asafetida acquires a greenish color on the addition of hydrochloric acid.

Varieties.—Liquid asafetida ; white, opaque, syrupy, or semifluid mass, gradually turning brown.

Asafetida in tears; tears of various sizes, distinct or adhesive and agglutinated.

Amygdaloid asafetida; the kind described above.

Stony asafetida; various sized angular or rounded pieces of gypsum and other earthy matters, agglutinated or merely coated with the milk-juice; unsuited for medicinal purposes.

Constituents.—Aside from the impurities asafetida contains 3 to 6 or 9 per cent. of volatile oil, 20 to 30 per cent., sometimes more of gum (partly soluble in water, mostly soluble in alkalies), and 50 to 70 per cent. of resin, of which a small portion (3 to 4 per cent.) is insoluble in ether, and which contains a little ferulaic acid, $C_{10}H_{10}O_4$. The volatile oil has the spec. grav. 0.98, and a strongly alliaceous odor, and contains two terpenes, a sesquiterpene, and two sulphur-compounds, $C_7H_{14}S_2$ and $C_{11}H_{20}S_2$. The tears yield 3 to 4 per cent. of ash. The earthy additions consist of calcium sulphate, calcium carbonate, and sand, occasionally to the amount of 40 per cent. On dry distillation the resin yields umbelliferon, and fused with potassa gives resorcin and protocatechuic acid.

Properties.—Stimulant, expectorant, laxative, antispasmodic. *Dose,* 0.3 to 1.5 grams (gr. v–xxij), in pills, emulsion, or tincture.

GALBANUM.—GALBANUM.

Origin. — Férula (Peucédanum, *Baillon*) galbaníflua, *Boissier et Buhse,* and other species of Ferula. *Natural order,* Umbelliferæ, Peucedaneæ.

Habitat.—Persia.

Production—Galbanum exudes spontaneously, chiefly from the lower part of the stem.

Description.—In tears, from the size of a pin's head to that of a pea, or larger, mostly agglutinated, forming a more or less hard mass; externally pale brownish, with a yellow or green tint, internally milk-white or yellowish, with a waxy lustre; odor peculiar, balsamic; taste bitter and acrid; partly soluble in ether and alcohol; yields with water a milk-white emulsion. When moistened with alcohol, it acquires a purple color on the addition of a little hydrochloric acid.

Varieties.—Galbanum in tears, the kind described above.

Lump galbanum; soft or hard masses, of a more or less brown color, inclosing tears or free from the same; it differs more or less in odor from the preceding and is often not colored by alcohol and hydrochloric acid. It may, in part, be derived from Férula rubricaúlis, *Boissier.*

Constituents.—Volatile oil 6 to 9 per cent., $C_{10}H_{16}$, resin 60 to 66 per cent. (soluble in ether, alcohol, carbon disulphide, and alkalies; yields on dry distillation a blue volatile oil and umbelliferon; fused with HKO, resorcin is obtained), gum 15 to 20 per cent., umbelliferon, $C_9H_6O_3$ (soluble in alcohol and ether, sparingly soluble in cold water, the latter solution blue fluorescent with ammonia). The volatile oil has the spec. grav. 0.91 and a mild aromatic taste, and consists of terpenes and sesquiterpenes.

Properties.—Stimulant, expectorant, antispasmodic. *Dose,* 0.3 to 2 grams (gr. v–xxx), in pills or emulsion, externally in plasters.

Allied Gum Resin.—Sagapenum; probably obtained from a species of Ferula; yellowish-brown or brown, amygdaloid or free from tears; blue by hydrochloric acid; contains umbelliferon, the volatile oil free from sulphur.

AMMONIACUM.—AMMONIAC.

Origin.—Doréma (Peucédanum, *Baillon*) Ammoníacum, *Don.* *Natural order,* Umbelliferæ, Peucedaneæ.

Habitat.—Eastern Persia and Turkestan.

Production.—Ammoniac exudes from the stem and root spontaneously, and in consequence of stings by insects.

Description.—Globular or irregular roundish, often somewhat flattened tears, either distinct or agglutinated, pale brownish-yellow externally, and breaking with a conchoidal waxy milk-white fracture. It softens by the heat of the hand, yields a white emulsion when triturated with water, and has a peculiar somewhat balsamic odor, and a bitter, acrid, and nauseous taste. When moistened with alcohol, it is not colored on the addition of hydrochloric acid.

Cake ammoniac, which exudes from the root, contains vegetable fragments, sand, and tears imbedded in a brown resinous mass; it should not be employed internally.

Constituents.—Volatile oil ½ to 4 per cent. (free from sulphur), resin 70 per cent. (an acid and an indifferent resin; does not yield umbelliferon), gum 18 to 22 or 28 per cent. (partly soluble in water, mostly soluble in alkalies), moisture 5 per cent., ash 3 per cent. The resin fused with HKO, yields protocatechuic acid and resorcin, $C_6H_6O_2$, which is soluble in simple solvents, volatile and inflammable, reddened on exposure and becomes purplish-black with ferric chloride.

Properties.—Stimulant, expectorant. *Dose,* 0.3 to 2 grams (gr. v–xxx), in pills and emulsion.

Allied Gum Resins.—African ammoniac from Férula tingitána, *Linné,* in Northern Africa; darker colored than the preceding, of a rather more agreeable odor and acrid not bitter taste; yields umbelliferon.

Opopanax from Opópanax Chirónium, *Koch,* of Southern Europe; dull reddish-brown masses or tears, friable, of waxy lustre; odor unpleasant; taste balsamic, bitter.

OLIBANUM.—FRANKINCENSE.

Origin.—Boswéllia Cartérii, *Birdwood,* and other species of Boswellia. *Natural order,* Burseraceæ, Bursereæ.

Habitat.—Eastern Africa and Southern Arabia.

Production.—Frankincense exudes from incisions made into the bark.

Description.—Roundish, oblong, or irregular tears, variable in size, externally dusty; fracture flattish, waxy, yellowish or pale reddish, translucent; odor balsamic terebinthinate, on burning strongly aromatic; softened by mastication; taste balsamic, bitterish; partly soluble in alcohol; yields with water a milk-white emulsion.

Lump olibanum consists of irregular impure masses which have been gathered from the ground.

Constituents.—Volatile oil 4 to 7 per cent. (olibene, $C_{10}H_{16}$, and little oxygenated portion), resin 56 to 72 per cent., gum about 30 per cent. (resembles arabin), bitter principle (soluble in alcohol and water), ash about 3 per cent.

Properties.—Stimulant, expectorant. *Dose,* 1 to 3 grams (gr. xv–xlv), in emulsion, mostly used in plasters and for fumigations.

MYRRHA.—MYRRH.

Origin.—Commíphora (Balsamodéndron, *Nees*), My′rrha, *Engler.* *Natural order,* Burseraceæ, Bursereæ.

Habitat.—Eastern Africa and Southwestern Arabia.

Production.—Myrrh exudes spontaneously from the bark.

Description.—Roundish or irregular tears or masses, dusty, brown-yellow or reddish-brown; fracture waxy, somewhat splintery, translucent on the edges, sometimes marked with whitish veins; odor balsamic; on mastication adhesive; taste aromatic, bitter and acrid. When triturated with water, myrrh yields a brown-yellow emulsion. Alcohol yields a brown-yellow tincture which acquires a purple hue on the addition of nitric acid. Dark-colored pieces the alcoholic solution of which is not rendered purple by nitric acid, and pieces of gum which dissolve completely or merely swell in water, and are but slightly soluble in alcohol, should be rejected.

Constituents.—Volatile oil 2 to 4 per cent. (contains $C_{10}H_{14}O$, is easily resinified), resin 25 to 40 per cent. (about 14 per cent. soluble in CS_2, 12 soluble in ether, 5 insoluble in ether), gum 40 to 60 per cent. (precipitated by lead acetate), bitter principle (soluble in alcohol and water), ash 3 to 4 per cent. With fusing potassa the resin yields protocatechuic acid and pyrocatechin.

Properties.—Stimulant, tonic, expectorant, emmenagogue, vulnerary. *Dose,* 0.3 to 2 grams (gr. v–ʒss), in pills and emulsion; externally in powder and tincture.

Impurities.—Besides vegetable fragments and sand, occasionally bdellium (see below) and dark-colored gums, the latter becoming adhesive when moistened.

Balsam of Mecca, a greenish, slightly turbid oleoresin, having a rosemary-like odor, is believed to be the exudation of Commíphora (Balsamodéndron, *Kunth*) Opobálsamum, *Engler*, which as B. Ehrenbergiánum, *Berg,* had been described as a source of myrrh.

BDELLIUM.—Bdellium.

Origin.—1. Commíphora (Balsamodéndron) Múkul, *Hooker;* 2. C. africána, *Engler. Natural order*, Burseraceæ, Bursereæ.

Habitat.—1. East India; 2. Western Africa.

Description.—1. Globular or irregular pieces, externally dusty; fracture flat conchoidal, dark brown or blackish, translucent in thin fragments. 2. Irregular, globular, or oval tears, externally dusty; fracture angular, waxy, yellowish to brown-red, translucent. Odor and taste myrrh-like; the tincture is not colored red by nitric acid.

Constituents.—Volatile oil, resin, gum, bitter principle.

Properties and Uses.—Similar to myrrh, mostly used in plasters.

CAMBOGIA.—Gamboge.

Gutti. Gambogia.

Origin.—Garcínia Hanbúrii, *Hooker filius*, s. G. Morélla, *Desrousseaux*, var. pedicelláta, *Hanbury. Natural order*, Guttiferæ (Clusiaceæ), Garcinieæ.

Habitat.—Anam, Camboja, and Siam.

Production.—The milk-juice exudes from incisions, and is collected in bamboo joints.

Description.—In cylindrical pieces, sometimes hollow in the centre, 25 to 50 millimeters (1 to 2 inches) in diameter, longitudinally striate on the surface; fracture flattish conchoidal, smooth, of a waxy lustre; orange-red or in powder bright yellow; inodorous; taste at first mild, afterward very acrid; the powder sternutatory. It is partly soluble in alcohol and ether; when triturated with water yields a yellow emulsion, and forms with solution of potassa an orange-red solution, from which, on the addition of hydrochloric acid, yellow resin is precipitated. Boiled with water, gamboge yields a liquid which after cooling does not become green with compound solution of iodine.

Varieties.—Pipe gamboge; the kind described above. Cake gamboge; in irregular lumps or cakes, dried in flat vessels; more liable to be adulterated.

Constituents.—Gum 16 to 26 per cent. (not precipitated by lead acetate or ferric chloride), resin or cambogic acid 66 to 80 per cent. (soluble in alcohol and ether; colored black-brown by ferric chloride; soluble in alkalies with a red color), wax about 4 per cent. (soluble in alcohol and alkalies), ash 1 per cent.

Properties.—Hydragogue cathartic. *Dose,* 0.03 to 0.3 gram (gr ss–v), in pills, in combination with other medicines.

EUPHORBIUM.—EUPHORBIUM.

Origin.—Euphórbia resinífera, *Berg.* *Natural order,* Euphorbiaceæ, Euphorbieæ.

Habitat.—Morocco.

Production.—Euphorbium exudes from incisions made into the stem.

Description.—In conical or globular nodular pieces, often hollow or inclosing fragments of the spines or flowers, dull brownish-yellow, slightly translucent, brittle; nearly inodorous, the dust violently sternutatory; taste very acrid; partly soluble in alcohol and ether; triturated with water, a turbid mixture is obtained, but not a complete emulsion.

Constituents.—Gum 18 per cent. (precipitated by lead acetate), resin, $C_{10}H_{16}O_2$, 38 per cent. (soluble in cold alcohol, very acrid), euphorbon, $C_{13}H_{22}O$ (tasteless, crystalline, soluble in ether, chloroform, and boiling alcohol), little starch, malates 12 per cent., ash about 10 per cent.

Properties.—Drastic purgative and emetic; sternutatory, rubefacient, vesicant, suppurant; only used externally.

SCAMMONIUM.—SCAMMONY.

Origin.—Convólvulus Scammónia, *Linné.* *Natural order,* Convolvulaceæ, Convolvuleæ.

Habitat.—Western Asia.

Production.—The top of the root is laid bare, thin slices are cut off, and the milk-juice is collected in shells.

Description.—Irregular angular pieces or circular cakes, greenish-gray or blackish, internally porous and of a resinous lustre, breaking with an angular fracture; odor peculiar, somewhat cheese-like; taste slightly acrid; powder gray or greenish-gray. When triturated with water, scammony yields a greenish emulsion. It does not effervesce with acids, and the decoction, when cold, is not colored blue by iodine. Ether dissolves at least 80 per cent. of it, and when the residue left on evaporating the ether is treated with a hot solution of potassa it yields a solution which is not precipitated by acids.

Constituents.—Resin 75 to 90 or 95 per cent., gum. The resin is scammonin, $C_{34}H_{56}O_{16}$, soluble in alcohol, ether, and benzol, and is identical with orizabin of Ipomœa orizabensis; it is by alkalies converted into scammonic acid, which is soluble in water.

Adulterations.—Calcium carbonate, starch, occasionally other resins.

Properties.—Hydragogue cathartic. *Dose,* 0.06 to 0.3 or 0.5 gram (gr. j–v–viij), in pills, powder, or emulsion, usually combined with other medicines.

5. RESINS.—RESINÆ.

Resins are solid, rarely crystalline, fusible, not volatile, combustible with a sooty flame, insoluble in water, but soluble in one or more of the following menstruums: alcohol, ether, chloroform, carbon disulphide, fixed oils, volatile oils, the fixed alkalies, carbonated alkalies, and ammonia. Those soluble in alkaline liquids (resin soaps) are called resin-acids.

Resins are excretions or secretions of plants, and are found either diffused in the other constituents, or contained in cells (heartwood of guaiacum), in ducts or upon the surface of plants. When exuding from plants, resins are dissolved in volatile oils.

The natural resins are usually mixtures of two or more resins; a few contain also benzoic or cinnamic acid; all are free from nitrogenated compounds. Those containing coloring matters may often be bleached by means of chlorine or by repeatedly precipitating them from their alcoholic solution with water.

Classification.

Sect. 1. Resins free from benzoic and cinnamic acids.

Greenish or gray friable fragments; bitter, containing crystals.	Elaterium.
Tears yellowish, transparent; on mastication plastic.	Mastiche.
on mastication pulverulent.	Sandaraca.
Masses yellowish to brown, transparent, brittle.	Colophonium.
Masses roundish, yellowish, transparent, harder than preceding.	Dammara.
Roundish or angular, often verrucose, yellowish to brownish, hard.	Copal.
Irregular, yellow to red-brown, hard and brittle; when heated, aromatic.	Succinum.

Brown-red sticks, or thin glossy brownish or brown fragments.	Lacca.
Tears or masses, greenish-brown, by tincture of ferric chloride blue or green.	Guaiaci resina.
Sect. 2. Resins containing benzoic or cinnamic acid.	
Sticks or cakes, brittle, dark brown-red; powder bright red.	Draconis resina.
Milk-white tears, imbedded in dull light brown or glossy reddish-brown mass.	Benzoinum.
Brittle pieces, externally brownish-yellow, internally yellow.	Xanthorrhœæ resina.

ELATERIUM.—ELATERIUM.

Origin.—Ecbállium (Momórdica, *Linné*) Elatérium, *Richard.* *Natural order,* Cucurbitaceæ, Cucumerineæ.

Habitat.—Western Asia, Northern Africa, and Southern Europe; cultivated.

Production.—The nearly ripe fruit is cut lengthwise, slightly pressed, the juice passed through a hair sieve and then set aside; the deposit is collected on calico and rapidly dried between bibulous paper or on porous tiles.

Description.—In light, friable, flattish, opaque fragments, pale green when fresh, afterward gray or light buff colored with minute crystals on the surface; fracture granular; odor slight, tea-like; taste acrid and very bitter. It does not effervesce with acid, and the decoction with water, after cooling, is not colored blue on the addition of a drop of compound solution of iodine. When 1 gram (16 grains) is exhausted with chloroform, and ether is added to the solution, a crystalline deposit of elaterin is obtained weighing not less than 25 centigrams (4 grains). About one-half of elaterium is soluble in hot alcohol.

Constituents.—Elaterin 25 to 33 per cent., chlorophyll, ash 8 to 10 per cent., perhaps also prophetin (soluble in ether, brown-red with sulphuric acid, bitter), ecballin (soft, yellow, acrid, and bitter), hydroelaterin (soluble in water), and elaterid (bitter, insoluble in ether and water). Elaterin, $C_{20}H_{28}O_5$, is crystalline, fusible at 200° C. (392° F.), readily soluble in chloroform and hot alcohol, sparingly soluble in ether, insoluble in water, alkalies and petroleum benzin, very bitter in alcoholic solution, and is not colored by chlorinated alkalies, but colored red by warm sulphuric acid; its solution in melted carbolic acid, on the addition of sulphuric acid, acquires a crimson color, rapidly changing to scarlet.

Adulterations.—Starch and calcium carbonate or other mineral substances are used for this purpose.

Properties.—Hydragogue cathartic. *Dose,* 0.008 to 0.016 gram (gr. $\frac{1}{8}$–$\frac{1}{4}$); elaterin, 0.004 to 0.005 gram (gr. $\frac{1}{16}$ to $\frac{1}{12}$), in pill or alcoholic solution.

MASTICHE.—MASTIC, MASTICH.

Origin.—Pistácia Lentíscus, *Linné.* *Natural order,* Anacardiaceæ, Anacardieæ.

Habitat.—Mediterranean basin.

Production.—Mastic exudes from vertical incisions into the bark of the staminate trees, and is collected in the island of Scio.

Description.—Globular or elongated tears, of the size of a pea, or larger, sometimes covered with a whitish dust, pale yellow, transparent, of a glass-like lustre, brittle, becoming plastic when masticated; spec. grav. 1.07; melting-point about 106° C. (223° F.); odor weak, balsamic, stronger on heating; taste slight terebinthinous and faintly bitter; soluble in ether and volatile oils; benzol dissolves from 65 (old mastic) to 90 (recent mastic) per cent.

Bombay mastic from Pistácia cabúlica and P. Khínjuk, *Stocks*, closely resembles Scio mastic, but is usually less clean and more opaque.

Constituents.—Volatile oil, $C_{10}H_{16}$, 1 to 2 per cent., alpha resin or mastichic acid, $C_{20}H_{32}O_2$, 90 per cent. (soluble in alcohol), masticin (insoluble in alcohol).

Adulterations.—Sandarac, see below.

Properties.—Mild stimulant, mostly used as a masticatory, for filling decayed teeth, for cements and varnishes.

SANDARACA.—Sandarac.

Origin.—Callítris quadriválvis, *Ventenat.* *Natural order*, Coniferæ, Cupressineæ.

Habitat.—Northwestern Africa.

Production.—Sandarac exudes spontaneously or from incisions made through the bark.

Description.—Elongated, pale yellow tears, 5 to 15 millimeters ($\frac{1}{5}$–$\frac{3}{5}$ inch) long, covered with a whitish dust, of a glass-like lustre, transparent, hard but brittle, becoming pulverulent when masticated; spec. grav. about 1.07; melting-point near 135° C. (275° F.); odor and taste somewhat terebinthinous, balsamic, and faintly bitter; soluble in hot alcohol and ether, partly soluble in volatile oils and chloroform.

Constituents.—Three resins, differing in solubility; bitter principle, soluble in water.

Properties.—Mild stimulant; used chiefly for varnishes.

COLOPHONIUM.—Resin, Rosin.

Resina.

Origin.—Pínus palústris, *Miller* (P. austrális, *Michaux*), and other species of Pinus. *Natural order*, Coniferæ, Abietineæ.

Habitat.—United States.

Production.—The volatile oil is distilled from turpentine; the residue constitues colophony.

Description.—Transparent amber-colored brittle masses, having a glossy and shallow conchoidal fracture, melting at about 100° C. (212° F.); odor and taste faintly terebinthinate; soluble in alcohol, ether, volatile oils, fixed oils, chloroform, benzol, glacial acetic acid, and alkalies.

Varieties.—Distinguished according to color.

Constituents.—Abietic anhydrid, $C_{44}H_{62}O_4$, in the presence of dilute alcohol converted into abietic acid, which is crystalline and dissolves in carbon disulphide, benzol, alcohol, ether, chloroform, glacial acetic acid and alkalies.

Properties.—Mild stimulant; used in plasters and ointments.

DAMMARA.—DAMMAR.

Origin.—1. A'gathis Dámmara, *Richard* (Dámmara orientális, *Lambert*); A'gathis austrális, *Salisbury* (Dámmara austrális, *Lambert*). *Natural order*, Coniferæ, Abietineæ.

Habitat.—1. East India islands; 2. New Zealand.

Production. — Dammar exudes spontaneously; the New Zealand dammar or kauri resin is also found fossil.

Description.—Transparent straw-colored roundish masses, about 1.08 spec. grav., having a glossy conchoidal fracture, melting near 120° C. (248° F.) to a thick liquid; harder than rosin, but softer than copal; nearly inodorous and tasteless; partly soluble in alcohol and benzin; more soluble in ether, chloroform, benzol, and carbon disulphide.

Kauri resin has the spec. grav. 1.11, softens somewhat between the teeth, is often in large masses, melts at or above 180° C. (356° F.) and is also sold as copal.

Several species of Vatéria and Hópea (*order* Dipterocarpeæ) and of Engelhárdtia (Juglandeæ) of India yield resins likewise known as dammar.

Constituents.—Resin acid 1 per cent. (soluble in solution of K_2CO_3), resin insoluble in alcohol, about 40 per cent., and resin soluble in alcohol about 60 per cent. (Graf, 1889). By distillation in a current of steam, a terpene, $C_{10}H_{16}$, of the boiling point 158° C. (316° F.), is obtained.

Uses.—Mostly for varnishes, and rarely in plasters.

COPAL.—COPAL.

Origin.—Fossil in Zanzibar and probably in Western tropical Africa; also the exudations of different species of

Trachylobium, Hymenæa, and Guibourtia. *Natural order*, Leguminosæ, Cæsalpinieæ, Amherstieæ.

Habitat.—Africa, South America, West Indies.

Description.—Irregular spherical or flattish and angular, the surface often finely verrucose (goose skin), varying between pale yellowish, reddish, and brownish, and after melting darker colored, spec. grav. 1.04, nearly as hard as amber, transparent, or translucent; fracture conchoidal, glossy; inodorous and tasteless; melting points of the different varieties vary between about 180° to 300° C. (356° and 572° F.); partly soluble in solvents; after fusion more readily soluble in alcohol and oil of turpentine.

Constituents.—Several resins, differing in solubility.

Uses.—For the preparation of varnishes.

SUCCINUM.—Amber.

Origin.—Fossil, from Pícea succinífera, *Conwentz* (Pinítis succínifer, *Gœppert*), and other extinct coniferous trees of the southern coast of the Baltic and other localities.

Description.—Roundish or flattish pieces, the surface usually rough and dull; hard and brittle; fracture conchoidal, glossy, transparent or translucent, pale yellowish to brown-red; inodorous but aromatic when heated; tasteless; spec. grav. 1.09; slightly soluble in chloroform, nearly insoluble in alcohol, ether, and oils, melts at 287.5° C. (550° F.), giving off succinic acid; and at a higher heat also water, volatile acids, and empyreumatic oil.

Constituents.—Succinic acid, $C_4H_6O_4$, and several resins.

Uses.—For fumigations, and for the preparation of succinic acid and (empyreumatic) oil of amber; also used in the arts.

LACCA.—Lac.

Origin.—1. Aleurítes laccífera, *Willdenow*; 2. Fícus índica, *Roxburgh*, and other trees. *Natural order*, 1. Euphorbiaceæ, Crotoneæ; 2. Urticaceæ, Artocarpeæ.

Habitat.—East Indies.

Origin.—Exudation resulting from punctures by the impregnated female Cóccus Lácca, *Kerr, order* Hemiptera.

Description.—Stick lac. Thin branches, covered with a brown-red resin, containing a blackish-red powder; softens between the teeth and colors the saliva red; taste bitterish, slightly astringent; on being heated, of an aromatic odor.

Seed lac. Irregular, somewhat glossy fragments, detached from the twigs.

Lump lac. Made by boiling with water and melting. Brown translucent cakes, deprived of the purplish-red coloring matter.

Shellac. Thin, glossy, more or less transparent fragments, varying from amber-colored to dark brown; brittle, tasteless; soluble in the fixed alkalies and in borax solution; almost wholly soluble in cold alcohol, ether, and volatile oils.

Constituents.—Coloring matter (lac dye), five resins, waxy matter.

Uses.—For the preparation of varnish and sealing-wax.

GUAIACI RESINA.—Guaiac Resin.

Origin.—Guaíacum officinále, *Linné. Natural order,* Zygophylleæ.

Habitat.—West India Islands and Northern South America.

Production.—Guaiac resin exudes from incisions through the bark, but it is mostly obtained by melting the resin of the heartwood with fire.

Description.—Irregular brittle masses, or subglobular tears about 10 to 25 millimeters ($\frac{2}{5}$–1 inch) in diameter, greenish-brown or reddish-brown, internally of a glassy lustre, transparent in thin splinters; spec. grav. 1.20; melting point 85° C. (185° F.); feebly aromatic, somewhat acrid; powder grayish, turning green on exposure; soluble in alkalies, alcohol, acetone, ether, chloroform; partly soluble in oil of cloves; sparingly so in carbon disulphide, benzin, and benzol; the alcoholic solution is colored blue on the addition of ferric chloride, chlorine, chromic acid, or other oxidizing agents.

Guaiac resin fused with KHO yields protocatechuic acid.

Impurities.—Fragments of wood and bark, sometimes amounting to 30 per cent.

Constituents.—Guaiacic acid and guaiac yellow (both crystalline, dissolved by milk of lime), guaiaretic acid, $C_{20}H_{26}O_4$, about 10 per cent. (crystalline, not colored blue by nitric acid), guaiaconic acid, $C_{19}H_{20}O_5$, about 70 per cent. (amorphous, colored blue by oxidizing agents), beta-resin about 10 per cent. (insoluble in ether), little gum and ash, 0.3 per cent. By dry distillation are obtained guaiacene, C_5H_8O (odor of bitter almond), guaiacol, $C_7H_8O_2$ (colorless aromatic oil, green by Fe_2Cl_6), creosol, $C_8H_{10}O_2$ (resembling guaiacol), and pyroguaiacin, $C_{18}H_{18}O_3$ (inodorous scales, colored green by Fe_2Cl_6 and blue by warm sulphuric acid).

Properties.—Stimulant, diaphoretic, alterative. *Dose,* 0.5 to 2 grams (gr. viij–xxx), in pills, mixture, or tincture.

DRACONIS RESINA.—DRAGON'S BLOOD.

Sanguis draconis.

Origin.—Cálamus (Dæmónorops, *Martius*) Dráco, *Willdenow.* *Natural order*, Palmeæ, Lepidocaryæ.

Habitat.—Borneo, Sumatra, and adjacent islands.

Production.—Dragon's blood exudes spontaneously from the fruit while ripening, is separated by beating and sifting, softened by heat, and moulded. Inferior qualities are obtained by heating the fruit, or boiling it in water.

Description.—In tear-like grains; in globular pieces about 35 millimeters (1$\frac{2}{5}$ inches) in diameter; in cylindrical sticks about 30 centimeters (12 inches) long and 15 millimeters ($\frac{3}{5}$ inch) thick, or in irregular cakes; externally dark brown-red; internally brighter red, transparent in thin splinters; brittle; fracture irregular and rather dull; inodorous—when heated aromatic, resembling benzoin; nearly tasteless; soluble (except the impurities) in alcohol, chloroform, benzol, and alkalies.

Constituents.—Red resin (by nitric acid converted into benzoic, nitrobenzoic, oxalic, and a little picric acid), waxy matter, benzoic acid 3 per cent., the latter obtainable by dry distillation. In place of the latter, cinnamic acid appears to be sometimes present, or both acids may be wanting. Fused with KHO, phloroglucin, benzoic and oxybenzoic acids are produced.

Properties.—Mild stimulant and astringent; used for plasters, tooth-powders, and varnishes.

BENZOINUM.—Benzoin.

Origin.—Sty′rax Bénzoin, *Dryander. Natural order,* Styraceæ.

Habitat.—Sumatra, Java, probably also Siam.

Production.—Benzoin exudes from incisions made into the bark of the tree.

Description.—In lumps consisting of agglutinated yellowish-brown tears, which are internally milk-white, or of a brown mass more or less mottled from whitish tears imbedded in it. It has a somewhat aromatic and acrid taste and an agreeable balsamic odor, gives off when heated fumes of benzoic acid, and is soluble in alcohol and in solution of potassa; the alcoholic solution is colored dark greenish-brown with ferric chloride; soluble in carbon disulphide and in benzol.

Varieties.—Sumatra benzoin. Mass brown-gray, somewhat porous, melting at 95° C. (203° F.), becoming sandy and finally plastic on mastication, and containing white tears melting at 85° C. (185° F.); partly soluble in carbon disulphide; odor rather weak, and in Penang benzoin somewhat like storax. Inferior kinds contain few or no tears, and sometimes a large percentage of chips.

Siam benzoin. Mass red-brown, translucent, with a variable proportion of large or small tears, almost wholly soluble in CS_2, softened and plastic on mastication, and melting at 75° C. (167° F.); odor agreeable, vanilla-like; taste slight.

Constituents.—Benzoic acid, $C_7H_6O_2$, 12 to 20 or 24 per cent. (usually fragrant from adhering volatile oil; needles or scales; when pure, melts at 121° C. (250° F.), boils at 249° C. (480° F.); sublimable; soluble in alcohol and ether, sparingly soluble in cold water), vanillin (in Siam benzoin), cinnamic acid, $C_9H_8O_2$ (variable quantity in Siam and Penang benzoin), several resins, yielding with melted potassa paroxybenzoic acid, $C_7H_6O_3$, protocatechuic acid, $C_7H_6O_4$, and pyrocatechin, $C_6H_6O_2$. Cinnamic acid is detected by boiling benzoin with milk of lime, filtering while warm, and adding potassium permanganate, when the odor of oil of bitter almond will become apparent. Benzoic acid may be prepared from toluol, from phthalic acid, and from hippuric acid (present in the urine of horses and cows).

Properties.—Stimulant, expectorant. *Dose*, 0.5 to 2 grams (gr. viij–xxx), in powder or tincture. Externally as a protective; also in tooth-powders, lotions, and fumigations.

XANTHORRHŒÆ RESINA.—ACAROID RESIN.

Botany Bay resin; Grasstree resin.

Origin.—Xanthorrhœ′a hástilis, *R. Brown*. *Natural order*, Liliaceæ, Lomandreæ.

Habitat.—Australia.

Production.—The spontaneous exudation on the leaves and in the stem is separated by crushing and sifting.

Description.—Brownish-yellow, brittle masses, opaque, internally light yellow, resembling gamboge, fusible; odor agreeable balsamic; taste balsamic, somewhat acrid; nearly insoluble in water; soluble in ether and alcohol, the solution turned brown-black by ferric chloride.

Red acaroid resin from Xanthorrhœ′a austrális, *R. Brown*, resembles dragon's blood, is deep brown-red, internally bright red, in thin splinters ruby-red and transparent; fracture *glass*-like; odor balsamic.

Constituents.—Benzoic acid, some cinnamic acid, resins. With melting potassa pyrocatechin, paroxybenzoic and protocatechuic acids are obtained. Oxidation with nitric acid gives picric acid.

Properties.—Mild stimulant, tonic. *Dose,* 0.5 to 1 or 2 grams (gr. viij–xv–xxx), in powder, mixture, or tincture. Mostly used in the preparation of colored varnishes.

6. BALSAMS AND OLEORESINS.—BALSAMA ET OLEORESINÆ.

The term balsam is often used to designate unctuous or liquid preparations, chiefly intended for external use, and to which valuable curative powers are attributed. It is also employed for those liquid or soft exudations of plants which are wholly or chiefly composed of resins and volatile oils, and are properly designated as oleoresins. The British and United States Pharmacopœias restrict the use of the word balsam to those liquid or soft products which contain resin, an odorous principle, and benzoic and cinnamic acids. Some authors recognize as solid balsams those resins which contain benzoic or cinnamic acid.

Classification.

Sect. 1. Containing benzoic or cinnamic acid: Balsams.

Liquid, black-brown, aromatic, slightly soluble in oil of turpentine.	Balsamum peruvianum.
Semi-liquid or soft, in the cold brittle mass; aromatic, in thin layers; transparent.	Balsamum tolutanum.
Thick liquid, brown-yellow, transparent, aromatic, drying to a yellowish-brown resin.	Liquidambar.
Thick liquid, brown-gray, opaque; after the evaporation of the water, dark-brown, transparent.	Styrax liquidus.

Sect. 2. Free from benzoic or cinnamic acid: Oleoresins.

Thin or viscid liquid, light yellow or brownish, transparent; odor peculiar.	Copaiba.
Viscid liquid, opaque and grayish in reflected light, transparent and brown in transmitted light; odor like copaiba.	Gurjun.
Thick liquid, transparent, pale yellow; odor pleasantly terebinthinate.	Terebinthina canadensis.
Thick liquid, slightly turbid, pale yellow, somewhat fluorescent; odor terebinthinate.	Terebinthina Veneta.
Viscid, yellowish opaque liquid, becoming granular; or	Terebinthina.
Yellowish-white opaque mass; fracture crummy; odor terebinthinate.	
Yellowish-brown, opaque, brittle in the cold; fracture conchoidal, translucent.	Pix burgundica.
Dark red-brown, opaque, translucent on the edge, brittle in the cold.	Pix canadensis.
Yellowish mass, internally white, granular, opaque.	Elemi.
Thick liquid, black-brown, becoming granular; odor empyreumatic, terebinthinate; soluble in oil of turpentine.	Pix liquida.

BALSAMUM PERUVIANUM.—BALSAM OF PERU.

Origin.—Myróxylon (Myrospérmum, *Royle;* Toluífera, *Baillon*) Pereíræ, *Klotzsch.* *Natural order*, Leguminosæ, Papilionaceæ, Sophoreæ.

Habitat.—Central America.

Production.—The bark is loosened by beating, and charred; the exudation is collected on rags, and these are placed in hot water and expressed.

Description.—A rather thick, but not viscous, brownish-black liquid, in thin layers red-brown and transparent, of a syrupy consistence; spec. grav. about 1.135 to 1.150; odor agreeably balsamic and somewhat smoky; taste warm bitterish, afterward acrid. It has an acid reaction to test-paper, is completely soluble in five parts of alcohol, and in all proportions of absolute alcohol and chloroform; partly soluble in ether and volatile or fixed oils, and does not diminish in volume when agitated with an equal volume of cold petroleum benzin or water.

Constituents. — Cinnamein or benzylic cinnamate, $C_9H_7(C_7H_7)O_2$, about 60 per cent. (colorless aromatic oil), resin about 32 per cent. (insoluble in carbon disulphide; on dry distillation yields benzoic acid, styrol, C_8H_8, and toluol, C_7H_8), cinnamic acid, and small quantities of benz-alcohol, C_7H_8O, benzylic benzoate, $C_7H_5(C_7H_7)O_2$, stilbene, $C_{14}H_{12}$, styrol, styracin, and benzoic acid.

Adulterations.—Fixed oils (soluble in petroleum benzin; on trituration with sulphuric acid and washing with water, leave a sticky mass; mixed with lime and gradually heated to charring, a fatty odor is given off), resins, oleoresins, alcohol.

Properties.—Stimulant, expectorant, vulnerary. *Dose,* 0.5 to 2 grams (gr. viij–xxx), in emulsion, syrup, or alcoholic solution; externally in ointment.

BALSAMUM TOLUTANUM.—BALSAM OF TOLU.

Origin.—Myróxylon (Myrospérmum, *Richard*) Toluífera, *Kunth,* s. Toluífera Bálsamum, *Miller.* *Natural order,* Leguminosæ, Papilionaceæ, Sophoreæ.

Habitat.—Venezuela and New Granada.

Production.—The balsam exudes from V-shaped incisions and is received in calabash cups.

Description.—Semifluid or nearly solid, and then crystalline under the microscope; brittle in the cold, yellowish or brownish-yellow and transparent in thin layers; odor agreeably balsamic; taste aromatic, acidulous, faintly acrid. It is completely soluble in chloroform, ether, and alcohol, the solution being of an acrid reaction to test-paper, and is almost insoluble in water, petroleum benzin, and carbon disulphide.

Constituents.—Resins (not investigated; the principal constituents), benzylic benzoate, $C_7H_5(C_7H_7)O_2$ (colorless aromatic oil, spec. grav. 1.114; crystallizes, when pure, below 20° C. (68° F.) in laminæ), benzylic cinnamate, tolene, $C_{10}O_{16}$, 1 per cent. (colorless, thin, aromatic oil), cinnamic and benzoic acids.

Adulterations.— Turpentine (soluble in carbon disulphide), sweet gum (yields to warm petroleum benzin styracin, which crystallizes on cooling), storax or resins (the extract with carbon disulphide turns brown with H_2SO_4, but rose-red from pure tolu).

Properties.—Stimulant, expectorant, vulnerary. *Dose,* 0.5 to 2 grams (gr. viij–xxx), in emulsion or tincture, mostly used as an agreeable flavor.

LIQUIDAMBAR.—Sweet Gum.

Origin.—Liquidámbar Styracíflua, *Linne.* *Natural order,* Hamamelideæ.

Habitat.—United States from New York southward and southwestward; Mexico, and Central America.

Production.—The balsam exudes spontaneously under a subtropical climate.

Description.—Thick brownish-yellow clear liquid, or a transparent yellowish-brown resin, breaking in the cold with a resinous fracture, showing whitish streaks; softened by the warmth of the hand; odor pleasantly balsamic, storax-like; taste aromatic and pungent; soluble (except the impurities) in alcohol, ether, and chloroform.

Constituents.—Aromatic hydrocarbon 3½ per cent. (not identical with styrol), cinnamic acid 5½ per cent., styracin, and brown tasteless resin, containing storesin.

Properties.—Stimulant, expectorant, diuretic. *Dose,* 0.5 to 2 grams (gr. viij–xxx), in emulsion, also externally in ointment or cerate; mostly used as an agreeable flavor.

STYRAX.—Storax.

Origin.—Liquidámbar orientális, *Miller*. *Natural order*, Hamamelideæ.

Habitat.—Asia Minor.

Production.—The inner bark is steeped in hot water, and the melted balsam is skimmed off and expressed from the bark.

Description.—Semi-liquid, viscid, gray, opaque, separating on standing a heavier dark-brown, in thin layers transparent stratum; odor agreeably balsamic; taste balsamic and acrid; soluble (the impurities excepted) in alcohol, ether, chloroform, and carbon disulphide; warm petroleum benzin, agitated with storax, remains colorless, and, on cooling, deposits white crystals.

Constituents.—Styrol or cinnamene, C_8H_8 (colorless fragrant liquid, spec. grav. 0.906; boiling-point 145° C. (293° F.); at 200° C. converted into solid metacinnamene), cinnamic acid, $C_9H_8O_2$, little benzoic acid, styracin or cinnamyl cinnamate, $C_9H_7(C_9H_9)O_2$ (crystallizing from hot benzin), phenylpropyl cinnamate, $C_9H_7(C_9H_{17})O_2$ (inodorous thick liquid), ethyl cinnamate, $C_9H_7(C_2H_5)O_2$, a small quantity, probably ethyl-vanillin in minute quantity, storesin, $C_{36}H_{58}O_3$, in considerable quantity, and the cinnamic ether of this alcohol; also a resinous compound. Water and other impurities amount to from 25 to 30 per cent. Storesin is amorphous, melting near 145° C. (293° F.) or near 165° C. (329° F.); the latter variety forms with KHO a compound crystallizing in needles.

Properties.—Stimulant, expectorant, diuretic. *Dose*, 0.5 to 2 grams (gr. viij–xxx), in emulsion or tincture; mostly externally in liniment or ointment.

COPAIBA.—COPAIVA.

Origin.—1. Copaífera Langsdórffii, *Desfontaines.* 2. Cop. officinális, *Linné*, and other species of Copaifera. *Natural order*, Leguminosæ, Cæsalpinieæ, Cynometreæ.

Habitat.—1. Brazil. 2. Venezuela and New Granada.

Production.—The oleoresin flows from bore-holes or boxes cut through the bark into the heart-wood of the tree.

Description.—A more or less viscid liquid, pale yellow or brown-yellow, transparent or slightly turbid, lighter than water (spec. grav. 0.94–0.99); odor peculiar; taste bitter and acrid; soluble in absolute alcohol, ether, chloroform, benzol, carbon disulphide, and petroleum benzin; also in fixed and volatile oils.

Varieties.—Para copaiva; pale colored and limpid; usually contains 60 to 90 per cent. of volatile oil.

Maranham and Rio Janeiro copaiva; of the consistence of olive oil; contains 40 to 60, but sometimes 80 per cent. of volatile oil; yields, like Para copaiva, a clear mixture with one-third or one-half ammonia water.

Maracaibo copaiba; viscid, dark yellow or brownish, slightly turbid; contains 20 to 40 per cent. of volatile oil; solidifies with magnesia.

Constituents.—Volatile oil, $C_{15}H_{24}$ (spec. grav. 0.89; boiling-point about 255° C.—491° F.), bitter principle (soluble in water), and resins, bitterish, and mostly amorphous; copaivic acid, $C_{20}H_{30}O_2$, oxycopaivic acid, $C_{20}H_{28}O_3$ (from Para copaiva), and metacopaivic acid, $C_{22}H_{34}O_4$ (from Maracaibo copaiva), are crystalline.

Adulterations.—Turpentine (recognized by odor on warming); fixed oils (mostly insoluble in alcohol; on evaporation a soft and sticky residue is left; after completely neutralizing with KHO, more of the same alkali would be required for saponifying the fat); Gurjun balsam (is fluorescent, and on heating becomes gelatinous).

Properties.—Stimulant, expectorant, diuretic, laxative, nauseant. *Dose,* 0.5 to 2 or 4 grams (gr. viij–ʒss–j), in emulsion, pills, suppositories, etc.; the resin 0.3 to 0.6 gram (gr. v–x). Copaiba is also used as an addition to certain varnishes.

GURJUN.—Gurjun Balsam, Wood Oil.

Origin.—Dipterocárpus turbinátus, *Gaertner,* D. alátus, *Roxburgh,* and other species of Dipterocarpus. *Natural order,* Dipterocarpeæ.

Habitat.—India and East Indian Islands.

Production.—The oleoresin exudes from excavations cut into the wood and charred by fire.

Description.—Thick viscid liquid, opaque and grayish, greenish or brownish in reflected light, transparent and red-brown or brown in transmitted light; spec. grav. 0.947–0.964; odor resembling that of copaiba; taste bitter; soluble in chloroform, acetone, volatile oils, and carbon disulphide, partially soluble in alcohol, ether, and petroleum benzin. Above 130° C. (266° F.) it becomes permanently gelatinous or solid. On agitation with a mixture of nitric and sulphuric acids it is colored red and purplish.

Constituents.—Volatile oil, $C_{15}H_{24}$, 40 to 70 per cent. (dissolved in carbon disulphide, and agitated with a drop of mixed sulphuric and nitric acids, red or violet color is produced), gurjunic acid, $C_{44}H_{68}O_8$ (a small quantity; crystalline), resin (insoluble in potassa solution), and bitter principle.

Properties and Uses.—Similar to Copaiva.

TEREBINTHINA CANADENSIS.—Canada Turpentine.

Balsam of fir.

Origin.— A′bies balsámea, *Marshall. Natural order,* Coniferæ, Abietineæ.

Habitat.—Canada and Northern United States, west to Minnesota, and south along the mountains to Virginia.

Production.—The oleoresin is secreted in vesicles in the bark, and collected by puncturing them.

Description.—A yellowish or faintly greenish transparent viscid liquid, of an agreeable terebinthinate odor, and a bitterish, slightly acrid taste, on exposure drying slowly into a transparent mass; completely soluble in ether, chloroform, and benzol; partly soluble in alcohol.

Constituents.—Volatile oil, $C_{10}H_{16}$, 20 to 30 per cent., uncrystallizable resin, bitter principle soluble in water.

Allied Turpentines.—Oregon Balsam of Fir, from A′bies Menziésii, *Lindley*, resembles the preceding in physical properties when fresh; but becomes gradually granular and opaque.

Strassburg Turpentine, Terebinthina argentoratensis, from A′bies pectináta, *De Candolle*; like Canada turpentine, but completely soluble in absolute alcohol; odor slightly lemon-like; taste bitter, not acrid.

Venice Turpentine, Terebinthina veneta, from Lárix europæ′a, *De Candolle*, procured from the heart-wood by bore-holes; yellowish, greenish-yellow, or brownish, nearly transparent, slightly fluorescent; odor terebinthinate balsamic; taste bitter and acrid; completely soluble in 90 per cent. alcohol; dries to a clear varnish without becoming crystalline.

Adulterations.—Solutions of rosin in oil of turpentine, the turpentine odor disguised through the addition of another volatile oil, are sometimes sold.

Properties. — Stimulant, diaphoretic, diuretic; mostly used externally.

TEREBINTHINA.—TURPENTINE.

Terebinthina communis, s. vulgaris.

Origin.—Pínus austrális, *Michaux* (P. palústris, *Miller*), and P. Tæ′da, *Linné*. *Natural order*, Coniferæ Abietineæ.

Habitat.—United States, in the Atlantic and Gulf States from Virginia to Eastern Texas.

Production.—Turpentine exudes spontaneously, but is mostly collected in boxes cut into the alburnum.

Description.—Rarely seen in the American commerce as a yellowish, viscid, more or less opaque liquid. Usually as yellowish, opaque, tough masses, brittle in the cold, softened by the heat of the hand, crummy crystalline in the interior, of a peculiar odor, and bitter and acrid taste; known as white turpentine; also as Thus americanum or common frankincense, and corresponds to the *galipot* of French commerce.

European Turpentine is obtained from Pínus Pináster, *Solander*, P. Larício, *Poiret*, P. sylvéstris, *Linné*, and other allied species.

Constituents.—Volatile oil 20 to 30 per cent., abietic anhydrid, crystallizing as abietic acid, $C_{44}H_{64}O_5$; bitter principle soluble in water; small quantities of formic and succinic acids; perhaps also other resin acids (pinic and sylvic acids). Oil of turpentine, $C_{10}H_{16}$, is colorless, dextrogyre, or (the French oil) levogyre; spec. grav. 0.87; boiling-point 150°–160° C. (300°–320° F.); readily soluble in strong alcohol; forms with HCl a crystalline compound, $C_{10}H_{16}HCl$ (artificial camphor). Abietic acid is soluble in carbon disulphide, alcohol, ether, benzol, and glacial acetic acid, and on oxidation yields formic and acetic acids; the salts are amorphous and insoluble in ether, if pure.

Properties.—Stimulant, diuretic, diaphoretic, astringent, hæmostatic. *Dose*, 1 to 4 grams (gr. xv–ʒj), in pills (hardened with magnesia); externally in ointments and plasters. Oil of turpentine, 0.3 to 1 to 2 grams (gr. v–xv–xxx), in emulsion; externally in liniments.

Terebinthina Chia, Chian turpentine, from Pistácia Terebínthus, *Linné* (Anacardiaceæ), is greenish-yellow or brownish, hardens to a transparent mass, and has a fennel-like terebinthinate odor, and a mild bitterish taste.

PIX BURGUNDICA.—BURGUNDY PITCH.

Origin.—A′bies excélsa, *De Candolle*, s. Pínus A′bies, *Linné*. *Natural order*, Coniferæ, Abietineæ.

Habitat.—Europe, in the southern part in mountainous districts.

Production.—The oleoresin exudes spontaneously and from incisions, is melted in hot water, and strained.

Description.—Yellowish-brown or reddish-brown, opaque or translucent, not crystalline; hard, yet gradually taking the form of the vessel in which it is kept; brittle when cold; fracture shining, conchoidal; aromatic, not bitter; soluble in glacial acetic acid and strong alcohol.

Allied Products.—Resina pini; white turpentine fused in hot water and strained; resembles the preceding, but gradually becomes crystalline.

Terebinthina cocta; the residue from the distillation of turpentine with water, strained.

Constituents.—Volatile oil, $C_{10}H_{16}$, in variable proportion, water, and resin.

Substitution.—A mixture of rosin, palm oil or other fat, and water; incompletely soluble in warm glacial acetic acid.

Properties.—Stimulant, irritant; used in plasters.

PIX CANADENSIS.—CANADA PITCH. HEMLOCK PITCH.

Origin.—Tsúga (Pínus, *Linné*; A′bies, *Michaux*) canadénsis, *Carrière*. *Natural order*, Coniferæ, Abietineæ.

Habitat.—North America, from Nova Scotia west to Lake Superior, and southward, in the mountains, as far as Georgia and Alabama.

Production.—The oleoresin exudes from incisions; the wood and bark, rich in oleoresin, are heated in water, the melted oleoresin is skimmed off, remelted and strained.

Description.—Dark reddish-brown, opaque or translucent, not crystalline; hard, yet gradually taking the form of the vessel in which it is kept; brittle when cold; fracture shining, conchoidal; odor weak, terebinthinate, balsamic.

Adulteration.--Rosin.

Constituents.—Little volatile oil, water, and resins.

Properties.—Stimulant, irritant; used in plasters.

ELEMI.—ELEMI.

Origin.—Probably from Canárium commúne, *Linné*. *Natural order*, Burseraceæ, Bursereæ.

Habitat.—Philippine Islands.

Production.—The oleoresin exudes from incisions.

Description.—Soft, yellowish, granular, more or less crystalline; when old friable; odor strong, resembling fennel and lemon, somewhat terebinthinate; taste bitter, disagreeable, and pungent.

Constituents.—Volatile oil (terpene and polyterpenes) 10 per cent., breïn 60 per cent. (amorphous resin, readily soluble in cold alcohol), amyrin 25 per cent. (resin crystallizing from hot, strong alcohol), bryoidin (easily soluble in alcohol, bitter and acrid, crystallizes from hot water), breïdin (crystalline, less soluble in water and ether), elemic acid, $C_{35}H_{56}O_4$ (crystalline).

Varieties.—Manila elemi, described above.

Brazilian elemi, from I'cica (Burséra, *Baillon*) Icicaríba, *De Candolle*, and allied species; yellowish-white or greenish-white, fragrant.

Mauritius elemi, from Colophónia (Canárium) mauritiána, *De Candolle*, resembles Manila elemi.

Mexican elemi, probably from A'myris elemífera, *Royle;* yellow or greenish, more or less translucent, of waxy lustre.

Properties.—Stimulant, irritant; used in plasters and ointment.

PIX LIQUIDA.—TAR.

Origin.—The wood of different species of Pínus. *Natural order*, Coniferæ, Abietineæ.

Production.—The wood is subjected to destructive distillation, either in retorts or packed in stacks covered with earth.

Description.—Thick viscid semifluid, heavier than water, blackish-brown, transparent in thin layers, becoming granular and opaque by age; odor empyreumatic, terebinthinate; taste sharp, empyreumatic, and bitterish; of an acid reaction; soluble in alcohol, ether, chloroform, volatile oils, and potassa solution; partly soluble in water.

Constituents.—Acetic acid, and smaller quantities of formic, propionic, and capronic acids; acetone, methylic alcohol, mesit, toluol, xylol, cumol, methol; these pass over with the light oil of tar. Naphthalin, pyrene, chrysene, retene, paraffin, phenols, creasote, pyrocatechin, empyreumatic resin. The composition of commercial tar is variable.

Pyrocatechin or catechol, $C_6H_6O_2$, is crystalline, sublimable, readily soluble in water, alcohol, ether, and benzol, has a sharp persistent taste, and in aqueous solution becomes dark green with ferric chloride, changing to violet with alkali (sodium bicarbonate).

Naphthalin, $C_{10}H_8$, more largely present in coal-tar, forms pearly scales, has a strong aromatic odor and warm taste, is readily volatilized, melts at 79° C. (174° F.), boils at 218° C. (425° F.), dissolves freely in ether and hot alcohol. *Dose*, 0.1–0.5 gram (gr. jss–viij); externally as insecticide and anti-parasitic.

Creasote and phenol are poisonous; when taken in excessive doses, treatment consists in evacuation (stomach-pump, emetics, alkali sulphates); milk or white of egg; saccharated lime; stimulants.

Allied Products.—Juniper tar, Oil of Cade, Oleum cadinum, from the wood of Juníperus Oxycédrus, *Linné;* it is more liquid, and of a somewhat different odor.

Birch tar, Dagget, Oleum Rusci, from the wood of Bétula álba, *Linné*, has the peculiar odor of Russian leather, and contains much pyrocatechin.

Properties.—Stimulant, irritant, insecticide. *Dose*, 0.3 to 1.5 grams (gr. v–xxij), in pills, mixtures, and aqueous or vinous infusions; externally in ointment, plaster, and as fumigation.

7. VOLATILE OILS AND CAMPHORS.—OLEA VOLATILIA ET CAMPHORÆ.

Volatile oils are odorous volatile liquids which produce upon paper a greasy stain, disappearing on the application of heat. They are readily soluble in absolute alcohol, ether, chloroform, petroleum benzin, benzol, carbon disulphide, and fixed oils, and many of them dissolve also freely in 80 per cent alcohol. All are but slightly soluble in water. They exist ready-formed in plants, but in some cases (volatile oils of mustard, almond, etc.) are the results of chemical action in the presence of water. They are mostly obtained by distillation with water, occasionally by expression of the parts containing them, like the volatile oils of lemon, orange-peel, etc.

Volatile oils are usually mixtures of two or more compounds, differing in volatility and odor, the portion volatilizing first being sometimes designated as *elœopten*, and the portion volatilizing last as *stearopten* or *camphor*. The latter usually contains oxygen, the former mostly consists of carbon and hydrogen; a few volatile oils (of mustard, garlic, asafetida) contain sulphur, and in the volatile oils of amygdaleæ (almond, etc.) nitrogen is found combined with hydrocyanic acid. The compounds existing in volatile oils are mostly imperfectly known; but besides the hydrocarbons, some of these have been proved to belong to the classes of alcohols, aldehyds, ethers, and compound ethers. The yellow, blue, and brown color of volatile oils is due to distinct compounds, which may be removed, in most cases, by careful rectification.

On exposure to the air, more particularly in the presence of light and moisture, volatile oils become darker and thicker or even solid from resinification; the addition of a little alcohol will usually retard or prevent these changes.

As a class, the volatile oils consisting of hydrocarbons are lightest in color and in specific gravity (the latter generally ranging between 0.85 and 0.91), are less prone to resinification, and are not freely soluble in 85 per cent. alcohol. The oxygenated volatile oils have usually a density from 0.90 to 0.99, and several of them are heavier than water, some being 1.10. They are mostly more freely soluble in 80 per cent. alcohol, are usually more or less colored, and the color is deepened on exposure.

Adulterations.—Chloroform (adapted only to the heavy volatile oils) is readily detected on fractional distillation at a temperature of about 70° C. (158° F.).

Alcohol will dissolve or soften fragments of fused calcium chloride or dry potassium acetate. Agitation with water will cause a diminution of volume.

Fixed oils will leave a permanent greasy stain on paper; on agitation with 80 per cent. alcohol, the volatile oil will be dissolved and the fixed oil left behind.

Cheap volatile oils are recognized by their odor on the slow evaporation from bibulous paper or from the hands. The behavior to alcohol and to various chemical reagents is sometimes of value, and it has been suggested to determine for essential oils the "iodine number" in a similar manner as is done for fixed oils. The variations in the proximate composition of the volatile oils, and the presence or absence of coloring principles, often render the detection of adulteration, by means of reagents, very difficult.

Properties.—Externally employed volatile oils are stimulant and rubefacient; used internally they are carminative, diaphoretic, antispasmodic, and sedative.

Antidotes.—The effects of overdoses are counteracted by evacuants (stomach-pump, emetics, and purgatives), demulcent drinks, and opium.

CAMPHORA.—Camphor.

Origin.—Cinnamómum (Laúrus, *Linné*) Cámphora, *F. Nees et Ebermaier*, s. Cámphora officinárum, *C. Bauhin*. *Natural order*, Laurineæ, Perseaceæ.

Habitat.—China and Japan.

Production.—The branches and chipped wood are exposed to the vapors of boiling water, the volatilized camphor is condensed, drained and pressed from the adhering volatile oil (oil of camphor), and subsequently refined by sublimation in vessels of glass or iron.

Description.—Crude camphor is in whitish granular masses, that from Japan having often a reddish tint, while Formosa camphor is grayish or blackish and more impure. Refined camphor is in translucent masses of a tough consistence and crystalline texture, readily pulverizable in the presence of a little alcohol or ether, has the spec. grav. 0.99, melts at 175° C. (347° F.), boils at 205° C. (401° F.), sublimes and burns without leaving any residue; odor penetrating, peculiar; taste pungent and bitter, afterward cooling; readily soluble in alcohol and most other solvents, but sparingly soluble in water; the solutions are dextrorotatory. It is liquefied in contact with chloral hydrate, phenol, thymol, resorcin, and other substances.

Composition.—$C_{10}H_{16}O$. Heated with zinc chloride it yields cymol, $C_{10}H_{14}$, and with nitric acid, camphoric acid, $C_{10}H_{16}O_4$, and camphoronic acid, $C_9H_{12}O_5$. Camphoric acid forms colorless, inodorous prisms, melts at 180° C. (356° F.), is freely soluble in alcohol, sparingly so in water, insoluble in carbon disulphide. Camphoronic acid melts at 136° C. (277° F.) with decomposition, and is freely soluble in water and alcohol.

Allied Camphor.—Borneo, Sumatra, or Barus camphor, from Dryobálanops Cámphora, *Colebrook*. *Natural order*, Dipterocarpeæ. It has a somewhat different odor, is slightly heavier than water, less readily volatile, and with nitric acid yields ordinary camphor. Composition $C_{10}H_{18}O$.

Properties.—Stimulant, antispasmodic, sedative, rubefacient, resolvent. *Dose*, 0.06 to 0.5 or 1 gram (gr. j–viij–xv), in pills or emulsion; externally in liniments and ointments. Camphoric acid in catarrhal affections externally and internally, 1 gram (gr. xv) or more.

THYMOL.—THYMOL.

Origin.—Thy′mus vulgáris, *Linné*, Monárda punctáta, *Linné*, Cárum A′jowan, *Bentham et Hooker*. *Natural order*, Labiatæ (Thymus, Monarda); Umbelliferæ (Ajowan).

Production.—From the volatile oil by fractional distillation, by freezing, or by means of alkali solution. Oil of monarda yields about 24 per cent. of thymol.

Properties.—Colorless rhombic scales or flat prisms, spec. grav. 1.06, of a thyme-like odor and pungent taste;

melts at 50° C. (122° F.), boils at 230° C. (446° F.); freely soluble in simple solvents (sparingly in water) and in alkalies; liquefied by camphor. The aqueous solution is rendered turbid by bromine water, but is not colored by ferric chloride. Thymol dissolves in H_2SO_4 with yellow color, becoming rose-red on warming; on diluting with water, agitating with excess of lead carbonate and filtering, the liquid (containing thymolsulphonate) becomes violet with ferric chloride. The solution of thymol in glacial acetic acid becomes blue green on the addition of H_2SO_4, followed by a drop of nitric acid.

Composition.—$C_{10}H_{14}O$.

Properties.—Stimulant, antiseptic. *Dose*, 0.1 to 0.3 gram (gr. jss–v); used most externally.

MENTHOL.—PIPMENTHOL.

Origin.—Méntha piperíta, *Linné.* *Natural order*, Labiatæ, Satureineæ.

Production.—By fractional distillation of the volatile oil, and freezing the higher boiling product.

Properties.—Fine white needles, transparent when examined singly, of an agreeable peppermint odor and taste; spec. grav. 0.89; melts at 43° C. (109° F.); boils at 212° C. (414° F.); freely soluble in most simple solvents, sparingly soluble in water; liquefied by chloral hydrate; produces a red color with bromine. The solution in H_2SO_4 is turbid red-brown, slowly separates a colorless oil and loses the mint odor.

Japanese or Chinese menthol, from Mentha canadensis, *Linné*, var. piperascens, resembles pipmenthol, but is usually moist from presence of oil, and has a mint-like odor, differing somewhat from that of peppermint.

Composition.—$C_{10}H_{20}O$.

Properties.—Stimulant, rubefacient, anodyne. *Dose*, 0.1 to 0.3 gram (gr. jss–v); used externally.

OLEUM CAMPHORÆ.—OIL OF CAMPHOR.

Origin and Production.—See Camphora.

Descriptions.—Deep yellow or yellowish-brown; spec. grav. about 0.94; boiling-point about 180° C. (356° F.); completely soluble in alcohol. Formosa camphor oil has a strong camphoraceous odor and in the cold separates camphor. Japanese camphor oil is more limpid, has a sassafras-like odor, and separates little or no camphor.

Composition.—Terpenes, cineol and terpineol, $C_{10}H_{18}O$, eugenol, safrol, camphor, and other compounds.

Properties.—Like camphor, mostly used in liniments.

OLEUM CAJUPUTI.—Oil of Cajeput.

Origin.—Melaleúca Cujupúti, *Roxburgh*, s. M. mínor, *Smith*, s. M. Leucadéndron, var., *Bentham*. *Natural order*, Myrtaceæ, Leptospermeæ.

Habitat.—East Indian Islands.

Production.—The leaves are distilled with water.

Description.—Green or, after rectification, colorless or yellowish, neutral, very mobile, easily soluble in alcohol; levogyre; spec. grav. about 0.925; odor aromatic; taste warm, camphoraceous, cooling; not congealing at —25° C. (—13° F). It dissolves iodine without violent reaction; the solution containing 20 per cent. iodine congeals in the cold crystalline.

Constituents.—Chiefly cajuputol (cineol), $C_{10}H_{18}O$; also hydrocarbons, $C_{10}H_{16}$ and $C_{15}H_{24}$, and acetic, butyric, and valerianic ethers of terpilenol ($C_{10}H_{18}O$). The crude (green) oil often contains a trace of copper, which yields a red-brown color or precipitate on agitating the oil with warm dilute hydrochloric acid and adding potassium ferrocyanide to the watery liquid.

Properties.—Carminative, stimulant, diaphoretic, rubefacient, counter-irritant. *Dose*, 0.1 to 0.5 or 1 gram (gr. jss–viij–xv), in mixtures; externally in liniments.

OLEUM ROSÆ.—Oil of Rose. Attar of Rose.

Origin.—Rósa damascéna, *Miller*. *Natural order*, Rosaceæ, Roseæ.

Habitat.—Cultivated in Bulgaria.

Production.—The flowers are distilled with water, cohobation being resorted to; yield about 0.03 per cent.

Description.—Pale yellow liquid, spec. grav. 0.87, of an agreeable rose odor when diluted, and a sweetish taste; reaction neutral; slightly dextrogyre; separates at or below 15° C. (59° F.) transparent scaly crystals, which remain suspended in the liquid.

Constituents.—Rhodinol, $C_{10}H_{18}O$ (possibly also $C_{10}H_{20}O$) very fragrant, readily soluble in alcohol; stearopten, 12–14 per cent., probably several hydrocarbons of formula C_nH_{2n}; inodorous, iridescent crystals, melt at 32.5° C. (90.5° F.); require about 100 parts of alcohol for solution.

Adulterations.—Spermaceti and paraffin crystallize in a rather opaque crust. An addition of oil of ginger-grass or roshé oil from Andrópogon Schœnánthus, *Linné*, lowers the congealing point of attar of rose, and imparts to it an acid reaction; the chief constituent is the alcohol geraniol, $C_{10}H_{18}O$.

Uses.—For perfuming ointments and mixtures.

OLEUM SUCCINI.—OIL OF AMBER.

Production—Amber is subjected to destructive distillation, and the thick brown liquid distillate is rectified.

Description.—Pale yellow, spec. grav. 0.91–0.95; odor empyreumatic, balsamic; taste warm and acrid; soluble in 4 parts of strong alcohol; with nitric acid it acquires a red color, and after some time is almost wholly converted into a brown resinous mass, having a musk-like odor.

Adulterations.—Petroleum and the empyreumatic oils of resins.

Properties.—Stimulant, antispasmodic, irritant. *Dose,* 0.2 to 0.5 or 1 gram (gr. iij–viij–xv), in capsules or emulsion; externally in liniments.

Syllabus of the Officinal Volatile Oils.

Magnoliaceæ.

Oleum Anísi stelláti, from the fruit of Illícium vérum, *Hooker filius.* Pale yellow, sweet; congeals at about 10° C. (50° F.), while at rest, at about 1° C. (34° F.); spec. grav. 0.98, levogyre; consists of $C_{10}H_{16}$ and anethol, $C_{10}H_{12}O$, with little safrol, anisic acid, hydroquinone ethylester, etc.; with alcoholic HCl becomes brownish.

Cruciferæ.

Oleum Sinápis, from the seeds of Brássica nígra, *Koch;* yield 0.5 per cent. Yellow, neutral, spec. grav. 1.018, pungent and acrid, soluble in 3 parts of sulphuric acid without change of color; boiling-point 148° C. (298° F.); without rotating power; chiefly allyl sulphocyanide, $C_3H_5.CNS$ with some CS_2.

Rutaceæ.

Oleum Rútæ, from the herb of Rúta graveólens, *Linné.* Greenish yellow, neutral, spec. grav. 0.88, bitterish; congeals below 0° C. (32° F.); solution in sulphuric acid brown-red; chiefly methyl-nonyl-ketone, $CH_3CO.C_9H_{19}$.

Oleum Limónis, from the rind of Cítrus Limónum, *Risso.* Yellowish, neutral, spec. grav. 0 852, bitterish; dextrogyre; boiling-point about 175° C. (347° F.); chiefly citrene, $C_{10}H_{16}$, with citral, $C_{10}H_{16}O$.

Oleum Bergámii, from the rind of Cítrus Bergámia, var. vulgáris, *Risso.* Greenish, faintly acid, spec. grav. 0.87, bitterish; boiling-point about 185° C. (365° F.); dextrogyre; consists of citrene, $C_{10}H_{16}$, and the acetic ester of linalool.

Oleum Aurántii amári, from the rind of Cítrus vulgáris, *Risso.* Yellowish, neutral, bitterish, spec. grav. about 0.86; chiefly hesperidene (citrene), $C_{10}H_{16}$.

Oleum Aurántii dúlcis, from the rind of Cítrus Aurántium, *Risso.* Yellowish, neutral, spec. grav. about 0.86; chiefly hesperidene, $C_{10}H_{16}$, with some geranial $C_{10}H_{16}O$; readily altered on exposure.

Oleum Aurántii flórum, from the flowers of Cítrus vulgáris, *Risso.* Colorless or brownish, neutral, bitterish, spec. grav.

about 0.88; boiling-point about 190° C. (374° F.); dextrogyre; gives violet fluorescence with alcohol; chiefly $C_{10}H_{16}$; the stearopten melts at 55° C. (131° F.).

Leguminosæ.

Oleum Copaíbæ, from the oleoresin of Copaífera spec. Colorless, neutral, spec. grav. 0.89; boiling-point about 255° C. (491° F.); levogyre; consists of $C_{15}H_{24}$. The oil of Maracaibo copaiva becomes dark blue with gaseous HCl.

Rosaceæ.

Oleum Amy′gdalæ amáræ, from the seeds of Prúnus Amy′gdalus, *Baillon* (Amy′gdalus commúnis, *Linné*, var. amára, *De Candolle*). Yellowish, slightly bitter, spec. grav. 1.07 (1.049, if deprived of HCN by lime and ferric chloride); chiefly benzaldehyd, C_7H_6O with HCN, in old oil benzoic acid. Evaporated with potassa and alcohol, the residue, dissolved in distilled water, yields a nearly transparent solution, free from brown-yellow sediment (nitrobenzol). The bitter almond odor disappears on treatment with potassium permanganate, which has no action on nitrobenzol.

Oleum Rosæ (see page 484).

Myrtaceæ.

Oleum Cajupúti (see page 484).

Oleum Eucaly′pti, from the leaves of Eucaly′ptus glóbulus and Euc. amygdalína, *Labillardière*. Yellowish, neutral, spicy, and cooling; contains $C_{10}H_{14}$, $C_{10}H_{16}$, and $C_{10}H_{16}O$. Eucalyptol, $C_{10}H_{18}O$, is chemically identical with cajuputol and cineol.

Oleum Caryophy′lli, from the flower-buds of Eugénia caryophylláta, *Thunberg*. Yellowish-brown, slightly acid, taste hot, aromatic; faintly levogyre; spec. grav. 1.05; boiling-point about 250° C. (482° F.); contains $C_{15}H_{24}$, and eugenol, $C_{10}H_{12}O_2$.

Oleum Piméntæ, from the fruit of Eugénia Piménta, *De Candolle*. Colorless or pale yellow, slightly acid, spec. grav. 1.040–1.050; contains $C_{15}H_{24}$, and $C_{10}H_{12}O_2$.

Oleum My′rciæ, from the leaves of My′rcia ácris, *De Candolle*. Yellowish or brownish-yellow, slightly acid, spec. grav. 0.965–0.985, contains terpenes, eugenol, and little methyl eugenol. The last three oils congeal with potassa, and their alcoholic solution is colored purplish-blue or green by Fe_2C_6.

Umbelliferæ.

Oleum Cárui, from the fruit of Cárum Cárui, *Linné.* Colorless or yellowish, neutral, dextrogyre; spec. grav. 0.96; boiling-point about 175° C. (347° F.); contains carvene (chemically identical with limonene, citrene, hesperidene), $C_{10}H_{16}$, and carvol, $C_{10}H_{14}O$; the latter is colored light violet by Fe_2Cl_6, and congeals with ammonia and sulphydric acid.

Oleum Fœnículi, from the fruit of Fœnículum vulgáre, *Gaertner.* Colorless, neutral, sweet, dextrogyre; spec. grav. 0.97; congeals below 0° C. (32° F.); contains phellandrene, $C_{10}H_{16}$, and anethol, $C_{10}H_{12}O$.

Oleum Anísi, from the fruit of Pimpinélla Anísum, *Linné.* Colorless or yellowish, neutral, sweet, slightly levogyre or dextrogyre; spec. grav. 0.98; if at rest congeals near 10° C. (50° F.), the temperature rising to 15° C. (59° F.); becomes pink with alcoholic HCl; contains phellandrene, $C_{10}H_{16}$, and anethol, $C_{10}H_{12}O$.

Oleum Anéthi, from the fruit of Anéthum (Peucédanum, *Hiern*) gravéolens, *Linné.* Pale yellow, neutral, sweetish, dextrogyre; spec. grav. 0.88; citrene, $C_{10}H_{16}$, and carvol.

Oleum Coriándri, from the fruit of Coriándrum satívum, *Linné.* Colorless or yellowish, neutral, sweet, dextrogyre; spec. grav. 0.87; chiefly coriandrol, $C_{10}H_{18}O$ (boiling at 195° C.), with little dextropinene.

Valerianeæ.

Oleum Valeriánæ, from the rhizome and rootlets of Valeriána officinális, *Linné.* Yellowish or brownish, somewhat viscid, slightly acid, levogyre; spec. grav. 0.95: contains borneene $C_{10}H_{16}$, borneol, $C_{10}H_{18}O$, its ether $(C_{10}H_{17})_2O$, and its valerianic formic and acetic esters.

Compositæ.

Oleum Anthémidis, from the flowers of A′nthemis nóbilis, *Linné.* Pale blue, green, or yellow, slightly acid; spec. grav. 0.90; contains anthemol, $C_{10}H_{16}O$, and the butyl and amyl esters of angelic, valerianic and tiglinic acids.

Oleum Erigeróntis, from the herb of Erígeron canadénse, *Linné.* Pale yellow, neutral, strongly levogyre; spec. grav, 0.86; limonene, $C_{10}H_{16}$, and oxygenated compound. Its solution in acetic acid yields with bromine crystals of $C_{10}H_{16}Br_4$ (*Flückiger*).

Ericaceæ.

Oleum Gaulthériæ, from the leaves of Gaulthéria procúmbens, *Linné*. Yellowish or reddish, slightly acid, sweetish, slightly dextrogyre; spec. grav. 1.175–1.185; boiling-point 216° C. (421° F.); chiefly methyl salicylate, $CH_3.C_7H_5O_3$, about 0.4 per cent. of $C_{15}H_{24}$ and some benzoic ester; yields with nitric acid colorless crystals. Much of the commercial oil of wintergreen is distilled from the bark of the sweet birch, Bétula lénta, *Linné* (*Natural order*, Cupuliferæ Betuleæ), which consists of methyl salicylate.

Labiatæ.

Oleum Lavándulæ, from the flowers (and leaves) of Lavándula vera, *De Candolle*. Colorless or yellowish, neutral, bitterish, levogyre; spec. grav. about 0.90; boiling-point about 185° C. (365° F.); contains $C_{10}H_{16}$, and as chief constituents the alcohol $C_{10}H_{18}O$ (linalool) and its acetic ester. The oil from the flowers is most fragrant.

Oleum Ménthæ víridis, from the herb of Méntha víridis, *Linné*. Pale yellow, neutral, levogyre; spec. grav. 0.90, contains $C_{10}H_{16}$ and a compound, $C_{10}H_{14}O$.

Oleum Menthæ piperítæ, from the herb of Méntha piperíta, *Linné*. Pale yellow or greenish, neutral, taste warm and cooling, strongly levogyre; spec. grav. 0.90; contains menthol, $C_{10}H_{20}O$ (see page 483), and other compounds.

Oleum Thy′mi, from the herb of Thy′mus vulgáris, *Linné*. Red-brown or yellowish, neutral, slightly levogyre; spec. grav. 0.88; contains cymene, $C_{10}H_{14}$, thymene, $C_{10}H_{16}$, and thymol, $C_{10}H_{14}O$ (see page 482).

Oleum Hedeómæ, from the herb of Hedeóma pulegioídes, *Persoon*. Colorless or pale yellow, neutral, spec. grav. 0.94; dextrogyre; contains hedeomol, $C_{10}H_{18}O$, and formic, acetic, and isoheptoic esters.

Oleum Rosmaríni, from the leaves of Rosmarínus officinális, *Linné*. Colorless, neutral, dextrogyre; spec. grav. 0.90; contains about 80 per cent. $C_{10}H_{16}$, besides $C_{10}H_{16}O$, borneol and cineol, $C_{10}H_{18}O$.

Oleum Monárdæ, from the herb of Monárda punctáta, *Linné*, Reddish or browhish; spec. grav. 0.920–0.925. Contains $C_{10}H_{16}$ (levogyre), thymol (about 24 per cent.), and formic, acetic, and butyric esters.

Chenopodiaceæ.

Oleum Chenopódii, from the fruit of Chenopódium ambrosioídes, *Linné*, var. anthelmínticum, *Gray*. Pale yellow, neutral, bitterish; spec. grav. 0.92; boiling-point about 180° C. (365° F.); $C_{10}H_{16}$ and $C_{10}H_{16}O$.

Piperaceæ.

Oleum Cubébæ, from the fruit of Cubéba officinális, *Miquel.* Colorless or faintly greenish or yellowish, neutral, dextrogyre; spec. grav. 0.92; boiling-point about 250° C. (482° F.); contains little $C_{10}H_{16}$, and two hydrocarbons, $C_{15}H_{24}$.

Myristiceæ.

Oleum Myrísticæ, from the kernel of Myrística frágrans, *Houttuyn.* Colorless, neutral, dextrogyre; spec. grav. 0.93; boiling-point 160° C. (320° F.); chiefly myristicene, $C_{10}H_{16}$, also myristicol, $C_{10}H_{14}O$.

Laurineæ.

Oleum Cinnamómi, from the bark of Cinnamómum zeylánicum, *Breyne.* Yellow or reddish, slightly acid, sweet and spicy, somewhat levogyre; spec, grav. 1.05; chiefly cinnamic aldehyd, C_9H_8O, also cinnamyl acetate and hydrocarbons; in old oil cinnamic acid.

Oleum Cinnamómi Cássiæ, from the bark of Cinnamómum Cássia, *Blume.* Like the preceding; flavor less agreeable; slightly levogyre or dextrogyre; spec. grav. about 1.07.

Oleum Sássafras, from the root of Sássafras officinále, *Nees.* Yellowish or brownish, neutral, slightly dextrogyre; spec. grav. 1.09; contains safrene, $C_{10}H_{16}$, and chiefly safrol, $C_{10}H_{10}O_2$ (melts at 12° C. = 53.6° F.; no rotating power); with nitric acid dark red and resinous.

Santalaceæ.

Oleum Sántali, from the wood of Sántalum álbum, *Linné.* Light yellow, rather thick, slightly acid; dextrogyre or levogyre; spec. grav. 0.97–0.99; boiling-point about 275° C. (527° F.); contains $C_{15}H_{24}O$ and $C_{15}H_{26}O$.

Coniferæ.

Oleum Terebínthinæ, from the oleoresin of different species of Pinus. Colorless, neutral, bitterish; spec. grav. 0.87; consists of $C_{10}H_{16}$. American oil of turpentine is dextrogyre.

Oleum Juníperi, from the fruit of Juníperus commúnis, *Linné*. Colorless or faintly greenish, neutral, sweetish, slightly levogyre; spec. grav. 0.87; boiling-point 155° C. (311° F.); consists of $C_{10}H_{16}$ (pinene and other hydrocarbons).

Oleum Sabínæ, from the branches (tops) of Juníperus Sabína, *Linné*. Colorless, neutral, bitterish, dextrogyre; spec. grav. 0.91; boiling-point near 160° C. (320° F.), rising to over 200° C.; consists of $C_{10}H_{16}$.

Oleum Pícis líquidæ, from pine-wood tar. Yellowish or red-brown, acid, odor and taste tar-like; consists mainly of $C_{10}H_{16}$.

8. FIXED OILS AND WAXES.—OLEA PINGUIA ET CERÆ.

Fats are found in plants and animals, and are mostly colorless, or white, inodorous and tasteless; but some commercial fats always contain coloring matter and volatile oil or other odorous principle, and the fats of the volatile fatty acids have a distinct odor. All fats are lighter than water (spec. grav. mostly between 0.913 and 0.956), are insoluble in water and mostly also in cold alcohol; they are soluble in ether, chloroform, petroleum benzin, benzol, and carbon disulphide. The liquid fats are transparent; the solid fats melt, by heat, to a transparent liquid, and in that condition produce upon paper a greasy stain which does not disappear by heat. Fats are not volatile; when heated to about 300° C. (572° F.) they are decomposed with ebullition, at the same time darkening in color. They ignite with difficulty, but aided by a wick will burn readily with a luminous flame.

Fats may be obtained by treating the tissues with a solvent like carbon disulphide or benzin, or more generally by expression and by heat. Crude fats usually contain mucilaginous and protein compounds, from which they are freed by decantation or filtration; or they must be treated with certain chemicals for the removal of impurities, like alum, lead acetate, zinc chloride, a small quantity of alkali, or about ½ to 2 per cent. of sulphuric acid. The color of certain fats is destroyed by heat, or by exposure to sunlight, or by treatment with potassium dichromate and sulphuric acid.

Most fats are mixtures of two or more glycerides or glyceryl-esters, the most important of which are tristearin, $C_3H_5.3C_{18}H_{35}O_2$; tripalmitin, $C_3H_5.3C_{16}H_{31}O_2$; trimyristin, $C_3H_5.3C_{14}H_{27}O_2$; trilaurin, $C_3H_5.3C_{12}H_{23}O_2$; and triolein, $C_3H_5.3C_{18}H_{33}O_2$; these are usually designated as stearin, palmitin, olein, etc. The drying oils which gradually harden on exposure to the air contain linolein, the acid having the formula $C_{16}H_{28}O_4$. The same compound is stated to be present also in small proportion in most vegetable non-drying oils. Fats become rancid through the generation of volatile fatty acids, and perhaps of other compounds. On saponification most of the liquid and solid fats yield glycerin, $C_3H_8O_3$. Soaps made with potassa are softer than soda soaps, and the soaps of drying oils are softer than those prepared from non-drying oils. Woolfat or lanolin consists of cholesterin esters, is miscible with its weight of water, and saponified with difficulty.

Fats having a high fusing-point are often called waxes; but this name is more properly applied to the compounds of the fatty acids with the radicals of monatomic alcohols, such as cetyl, $C_{16}H_{33}$ (in spermaceti, ceryl, $C_{27}H_{55}$ (in Chinese wax), and myricyl, $C_{30}H_{61}$ (in beeswax).

Adulterations.—The detection is difficult. The specific gravity of the fat, and the melting and congealing points of the fat and of the isolated mixed fat acids, should be observed. Drying and non-drying oils are distinguished by the effect of nitrous acid, which causes the latter to congeal in the course of two or three hours to one or two days, through the conversion of liquid olein into solid elaidin; linolein and allied oils are not solidified by this agent. Trielaidin melts at about 38° C. 100° F.), and elaidic acid at 45° C. (113° F.). The test is applied by mixing 2 parts of nitric acid, spec. grav. 1.42, 3 parts of water, and 5 parts of the oil, and adding 1 part of copper. Maumené's sulphuric acid test is applied by stirring together 50 grams of the oil and 10 cubic centimeters of strong sulphuric acid, and noting the rise of temperature. Heydenreich's test consists in adding to 10 or 12 drops of the oil 2 or 3 drops of sulphuric acid, and noting the color, then stirring and again noting the color. For Calvert's test, 1 volume of sulphuric acid, spec. grav. 1.53, is agitated for about five minutes with 5 volumes of the oil, after which the color is observed. Hirschsohn's test for cottonseed oil consists in heating for twenty minutes in a water bath 3 cubic centimeters of the oil with 6 drops of chloroformic solution of crystallized auric chloride (0.5 per cent.), when a red color is produced. Arachis, ben, hemp, maize, poppy, and walnut oils are likewise colored red or dark, or precipitate metallic gold (Moerck). The other oils in the next table are not affected (Hirschsohn).

Oil of	Tests.			
	Nitrous acid.	Maumené's.	Heydenreich's.	Calvert's.
Almond	Whitish, solid	52° C.	Yellow	White.
Arachis	Whitish, solid	67	Yellow, green-brown	Yellow.
Cod-liver	Yellow, liquid	102	Purple, red	Purple.
Cottonseed	Yellow, soft	70	Reddish and brown	Yellow.
Hemp	Yellow, liquid	98	Brown, black, solid	Dark green.
Lard	Yellow, solid	27	Yellow, brown	Yellowish.
Linseed	Brownish, liquid	103	Brown-red, blackish	Dark green.
Mustard	Yellowish, solid	...	Green, brown	Greenish-brown.
Olive	Yellowish, solid	42	Yellow, brownish	Greenish.
Poppy	Yellow, liquid,	...	Yellow, brown-green	Grayish.
Rapeseed	Brownish, soft	58	Green or brownish	Brown.
Ricinus	Whitish, soft	47	Brownish	Grayish-white.
Sesame	Red-brown, soft	68	Brown-red, gelatinous	Dirty-green
Sunflower	Yellow, soft	...	Red brown, brown	Yellow.

In many cases the action of iodine or bromine upon the fat acids affords indication of the purity of fats. The fat acids of the acetic acid group are not altered at ordinary temperatures by these haloids; those of the oleic acid group take up two atoms, and those of the linoleic acid group four atoms of the haloid, and any excess of the latter may be determined in the usual manner. The amount of haloid thus taken up differs greatly for various oils, and varies comparatively little for each fat in its natural condition. Iodine is usually employed for this purpose, and the percentage of iodine combining with the oil is called the "iodine number."

Oils and fats.	Spec. grav. at 15° C.	Iodine number.	Melting-point of fat acids.	Saponification value.
Almond	0.9186	97.5–98	14° C.	194.5–196
Apricot	0 9191	99–102	4.5	192.9
Arachis	0.919	101–105	27–32	191.3
Butter	0.930	26–35	38.0	227.0
Butterin	......	55.3	42.0	
Cocoanut	0.870	8.9–9.3	24.6	257.3–268.4
Cod-liver	0.923	123–140	......	213.2
Cottonseed . . .	0.9228	105–115	30.0	195.0
Hemp	0.9276	143	19.0	193.1
Japan wax . . .	0.980	4.2	......	222.0
Lanolin (suint) . .	0.973	36	41.8	170.0
Lard	0.940	58–64	44	195.3–196.6
Lard oil	0.918	......	......	191–196
Laurel	......	49	27.0	
Linseed	0.935	154–160	17.0	189–196
Neatsfoot	0.916	66–70	30.0	190.9
Nut	0.926	142–144	20 0	196.0
Nutmeg	0.990	31.0	42.5	
Olive	0.9149	81.6–90.2	25–29	191.7
Olive seed . . .	0.9202	81.8	......	188.5
Palm	0.95	50.4–53.4	47.8	202–202.5
Poppy	0.925	135–137	19–24	194.6
Pumpkin	0.9241	121	28.0	189.5
Rape	0.9172	97–105	18–22	177.0
Ricinus	0.9613	84–93.9	13.0	181–181.5
Sesame	0.9213	105–108	25–30	190
Tallow	0.916	40–42	45.0	196.5
Theobroma . . .	0.950	34.0	52.0	

Hübl prepares the "iodine solution" by dissolving 25 grams iodine in 500 cubic centimeters strong alcohol, and

30 grams mercuric chloride in 500 cubic centimeters strong alcohol, mixing the two solutions and setting aside for ten hours. For testing, about 0.2 gram of a drying oil (or 0.3 gram non-drying oil, or 0.8 gram of solid fat) is dissolved in 10 cubic centimeters of chloroform, mixed with 20 cubic centimeters of the iodine solution, and set aside for about 2 hours, when the excess of free iodine is determined by sodium thiosulphate. The "iodine number" of the fat acids is determined in the same manner, using the mixed fat acids separated from the saponified fat by a mineral acid.

Free fat acids are estimated, in the presence of alcohol and phenolphthalein, by titration with KHO (acid number). Valenta's saponification value is an extension of Koettstorfer's method for butter-testing: 1 gram of fat is saponified by warming with 25 cubic centimeters of alcoholic solution of KHO (about ½ normal), and the excess of alkali determined by titration; the weight of KHO in milligrams required for combining with the fat acids gives the "saponification value;" on deducting from this the "acid number," the "ester number" is found—*i. e.*, the amount of KHO in milligrams required for neutralizing the fat acids present in combination.

Classification.

Sect. 1. Liquid fats.

I. Non-drying oils.

Yellowish, slightly nutty, not congealing at —10° C.	Ol. Amygdalæ expressum.
Pale yellow, deposits granules near 0° C.	Ol. Olivæ.
Yellow or brownish-yellow, solid at —18° C.	Ol. Sinapis expressum.
Pale yellow, opaque at 0° C.	Ol. Bubulum.
Yellowish, solidifying near 0° C.	Ol. Adipis.

II. Drying oils.

Yellow or brownish; not solid at —15° C.	Ol. Lini.
Pale yellow, bland, congeals at —18° C.	Ol. Papaveris.

Nearly colorless, nutty; congeals at —20° C.	Ol. Juglandis.
Green, unpleasant; congeals at —15° C.	Ol. Cannabis.

III. Intermediate oils.

Yellow, odor and taste fishy.	Ol. Morrhuæ.
Brownish-yellow, acrid.	Ol. Tiglii.
Yellowish, mawkish, slightly acrid.	Ol. Ricini.
Yellow, bland, congeals below 0° C.	Ol. Gossypii.
Yellow, bland, congeals at —5° C.	Ol. Sesami.
Yellow, bland, congeals at —10° C.	Ol. Maydis.

Sect. 2. Solid fats.

I. Containing volatile oil.

Butyraceous, granular, green, spicy.	Ol. Lauri.
Mottled orange-brown, melting at 45° C.	Ol. Myristicæ expressum.

II. Odorous, but free from volatile oil.

Yellowish-white, chocolate odor, melting at 30° C.	Ol. Theobromæ.
Orange-red, violet odor, melting at 27° C.	Ol. Palmæ.
Brownish-white, acrid, melting at 40° C.	Ol. Gynocardiæ.
White, disagreeable odor, melting at about 25° C.	Ol. Cocois.
Yellow, sweet, melting at 28° C.	Butyrum.
Whitish (the crude greenish-brown), animal odor, melting at 40° C.	Lanolinum.

III. With no characteristic odor.

White, melting at 35° C.	Adeps.
White, melting at 45° C.	Sevum.

Sect. 3. Waxes.

White, crystalline, melting at 50° C.	Cetaceum.
Yellow, or white, melting at 62° C.	Cera.

OLEUM AMYGDALÆ EXPRESSUM.—Almond Oil.

Origin.—Prúnus Amy'gdalus, *Baillon* (Amy'gdalus commúnis, *Linné*). *Natural order*, Rosaceæ, Pruneæ.

Habitat.—Western Asia, naturalized in the Mediterranean basin; cultivated.

Production.—Crushed bitter almonds are subjected to powerful pressure preceding their being used for preparing oil of bitter almond. Sweet almonds are likewise occasionally expressed. Yield 40 to 50 or 55 per cent.

Description.—Yellowish, thin, spec. grav. 0.918, congealing near —20° C. (—4° F.), of a slight nutty odor and bland taste. A mixture of the oil with an equal bulk of nitric acid, spec. grav. 1.16, on being warmed to 60° C. (140° F.) does not acquire a yellow or orange color. The mixed fat acids melt near 14° C. (57° F.) and solidify near 5° C. (41° F.).

Constituents.—Chiefly olein, very little palmitin.

Substitution.—The fixed oils expressed from the seeds of the peach (Prúnus Persica, *Linné*) and apricot (Prúnus Armeníaca, *Linné*) closely resemble almond oil; but warmed with nitric acid, spec. grav. 1.16, speedily turn yellow and orange-red. The fat acid of apricot oil melts near 5° C. (41° F.).

Properties.—Lenitive. *Dose,* 2 to 16 grams (ʒss–iv), in emulsion; externally in liniments and ointments.

OLEUM OLIVÆ.—OLIVE OIL.

Origin.—O′lea europæ′a, *Linné.* *Natural order,* Oleaceæ, Oleineæ.

Habitat.—Asia and Southern Europe; cultivated.

Production.—The crushed fruit, subjected to cold pressure, yields virgin oil; a second quality of oil is obtained by mixing the press cake with hot water, and again expressing; and an inferior more or less rancid oil is yielded from the residue after it has undergone decomposition.

Description.—Pale yellow or light greenish-yellow, spec. grav. 0.915 at 15° C., 0.911 at 24° C.; near 5° C. (41° F.) separating white crystalline granules; solid below 0° C.

(32° F.); of a slight agreeable odor, and a bland, faintly acrid taste. The mixture, made upon a porcelain slab, of 10 drops of the oil and 5 or 6 drops of sulphuric acid, does not acquire a brown-red or greenish-brown color. Agitated with a cold mixture of sulphuric and nitric acids it remains pale yellow or greenish. The mixed fat acids separated after saponification, melt at about 26.5° C. (80° F.) and begin to solidify at 17.5° C. (63.5° F.).

Constituents.—Mainly olein; the solid fats are chiefly palmitin with arachin and possibly stearin; also cholesterin, $C_{26}H_{44}O$, soluble in alcohol.

Properties and Uses.—Like Almond Oil. Olive oil, containing about 6 per cent. of free oleic acid, has been recommended as a substitute for cod-liver oil, under the name of *lipanin.*

OLEUM SINAPIS EXPRESSUM.—EXPRESSED MUSTARD OIL.

Origin.—The seeds of Brássica álba, *Hooker filius,* and Br. nígra, *Koch. Natural order,* Cruciferæ, Brassiceæ.

Habitat.—Asia and Southern Europe; cultivated.

Production.—The crushed seeds are subjected to cold pressure; yield about 22 per cent.

Properties.—Bright yellow (from white mustard) to brownish-yellow (from black mustard), spec. grav. 0.916, solid near —18° C., nearly inodorous, of a bland taste; iodine number 96.0. Nitroso-nitric acid colors reddish; zinc chloride colors dingy green.

Constituents.—Glycerides of oleic, stearic, erucic ($C_{22}H_{42}O_2$) and behenic ($C_{22}H_{44}O_2$) acids.

Uses.—Like olive oil.

OLEUM BUBULUM.—NEAT'S-FOOT OIL.

Production.—The fatty tissue of neat's feet is boiled with water and the fat skimmed off, strained and pressed.

Description.—Pale yellow, spec. grav. about 0.916, opaque at or below 0° C. (82° F.); odor slight; nearly tasteless. The fat acid melts near 30° C. (86° F.).

Constituents.—Olein and solid fats.

Uses.—Chiefly externally.

OLEUM ADIPIS.—LARD OIL.

Production.—Lard is exposed to a low temperature and expressed. Yield about 50 to 60 per cent.

Description.—Pale yellowish or colorless, spec. grav. about 0.918, solidifying near 0° C. (32° F.); odor and taste slight.

Constituents.—Olein with palmitin and stearin.

Uses.—Externally.

OLEUM LINI.—FLAXSEED OIL. LINSEED OIL.

Origin.—Línum usitatíssimum, *Linné.* *Natural order*, Lineæ.

Habitat.—Levant and Southern Europe; cultivated.

Production.—The crushed seeds are expressed; yield by cold pressure 16 to 20 per cent.; by hot pressure 25 to 28 per cent.

Description.—Yellow, limpid, spec. grav. about 0.935, congealing at —27° C. (—16.5° F.); odor slight; taste bland. The fresh pure oil dissolves in absolute alcohol in all proportions, and in 1 or 2 parts of 95 per cent. alcohol, becoming turbid with more. Expressed with heat, linseed oil is of a darker color, stronger odor, and acrid taste. The mixed fat acids melt near 17° C. (62.5° F.) The iodine number of linseed oil is 154–160 (Hübl), or 170–180 (Benedict).

Constituents.—Chiefly linolein, with palmitin and myristin. By exposure it dries to linoxyn, $C_{32}H_{54}O_{11}$.

Properties.—Demulcent, laxative. *Dose*, 4 to 65 grams (ʒj–℥ij); externally as a protective.

OLEUM PAPAVERIS.—Poppyseed Oil.

Origin. — Papáver somníferum, *Linné*. *Natural order*, Papaveraceæ, Papavereæ.

Habitat.—Western Asia; cultivated.

Production.—The crushed seeds are expressed. Yield 40 to 50 per cent.

Description.—Pale yellow, limpid, spec. grav. 0.925; congealing at about —18° C. (0° F.); odor slight; taste bland. The mixed fat acids melt near 20° C. (68° F.).

Constituents.—Chiefly linolein, with palmitin and perhaps other fats.

Properties.—Demulcent and protective.

OLEUM JUGLANDIS.—Nut Oil.

Origin.—1. Júglans régia, *Linné*. 2. Júglans cinérea, *Linné*. 3. Cárya amára, *Nuttall*. *Natural order*, Juglandeæ.

Habitat.—1. Central Asia; cultivated. 2, 3. North America, westward to Nebraska.

Production.—The crushed seeds are expressed; yield about 25 per cent.

Description.—Pale greenish or nearly colorless, somewhat thicker than the preceding, spec. grav. 0.92; congealing at about —18° C. (0° F.); odor and taste nutty. The mixed fat acids melt near 20° C. (68° F.).

Constituents.—Probably linolein with some solid fats.

Properties.—Like Poppyseed Oil.

OLEUM CANNABIS.—Hempseed.

Origin.—Cánnabis satíva, *Linné*. *Natural order*, Urticaceæ, Cannabineæ.

Habitat.—Southern and Central Asia; cultivated.

Production.—The crushed fruit (hempseed) is expressed; yield about 30 per cent.

Description.—Green, becoming lighter and brownish on exposure; spec. grav. 0.93; odor hemp-like; taste rather mild; thickens at —15° C. (5° F.). The mixed fat acids melt near 19° C. (66° F.).

Constituents.—Linolein, probably with palmitin.

Properties.—Like Poppyseed Oil.

OLEUM MORRHUÆ.—COD-LIVER OIL.

Oleum jecoris aselli.

Origin.—Gádus Mórrhua, *Linné*, and other species of Gadus. *Class*, Pisces. *Order*, Teleostia. *Family*, Gadida.

Habitat.—North Atlantic Ocean.

Production.—The fresh livers are slowly heated and the oil is decanted from the water, and sometimes deprived of a portion of the solid fat by partial freezing.

Description.—Pale yellow, limpid, faintly acid, spec. grav. 0.923; near 0° C. (32° F.), separating a white granular deposit; odor and taste mild, fishy. Sulphuric acid colors it deep violet, changing to brown red. If obtained by means of a greater heat, by boiling with water, or from stale livers, cod-liver oil is denser, has an amber-brown or dark-brown color, a stronger acid reaction, a more disagreeable odor and more or less bitter taste, and deposits granules at a higher temperature.

Constituents.—Chiefly olein, with pamitin and stearin, iodine 0.001 to 0.002 per cent., traces of chlorine, bromine, phosphorus, and sulphur, 0.3 cholesterin and other biliary compounds, probably also butyric and acetic acids. With 90 per cent. alcohol the oil yields about 3.5 per cent. of extract called morrhuol. A lecithin-like compound of the oil, when heated with acids or alkalies, is decomposed into glycerin, phosphoric acid, and morrhinic acid; the latter is oily or crystalline, soluble in hot water, and combines with acids and alkalies. Of the two alkaloids, aselline and morrhuine, the latter acts as a diuretic and diaphoretic (Gautier, 1888).

Adulteration with rosin oil or paraffin oil is recognized by saponifying with KHO in alcoholic solution; the soap of the pure oil is completely soluble in water.

Lipanin, recommended as a substitute for cod-liver oil, is olive oil containing about 6 per cent. of oleic acid, liberated after partial saponification.

Properties.—Demulcent, alterative. *Dose*, 8 to 16 grams (ʒj–ʒss).

OLEUM TIGLII.—CROTON OIL.

Origin.—Cróton Tíglium, *Linné.* *Natural order*, Euphorbiaceæ, Crotoneæ.

Habitat.—India and Philippine Islands; cultivated.

Production.—The crushed seeds are expressed or are exhausted by carbon disulphide; yield 30 to 40 per cent., or about 50 per cent. of the kernels.

Description. — Yellow or brownish-yellow, somewhat viscid, slightly acid, spec. grav. about 0.95; odor slight, unpleasant; taste oily, afterward acrid and burning. Croton oil is soluble in 1 part, but only partly soluble in 7 parts of absolute alcohol; it dissolves more readily in alcohol when old than when fresh. Croton oil dissolves in sulphuric acid, and the slightly darkened solution remains clear for some time.

Constituents.—Glycerides of formic, acetic, isobutyric, tiglinic ($C_5H_8O_2$), valerianic, lauric, myristic, palmitic, and stearic acids; also crotonol, $C_{18}H_{28}O_4$ (?). The purgative principle appears to be insoluble in alcohol, and the vesicating properties are due to a fat, the acid of which is closely related to oleic and ricinoleic acids (Senier); but Kobert (1887) considers crotonolic acid and its glyceride to possess purgative and vesicating properties.

Properties.—Powerful purgative, irritant poison, rubefacient. *Dose*, 0.016 to 0.12 gram (gr. ¼–ij), in fixed oil or emulsion; externally as an addition to liniments.

Antidotes. — Evacuants (stomach-pump or emetics); demulcents (white of egg, gruel, etc.); stimulants; morphine.

OLEUM RICINI.—Castor Oil.

Origin.—Rícinus commúnis, *Linné.* *Natural order,* Euphorbiaceæ, Crotoneæ.

Habitat.—India; cultivated.

Production.—The seeds are crushed, freed from integuments by winnowing, kiln-dried, and expressed; the oil is clarified by mixing with warm water and decanting. Yield by cold pressure about 30 per cent., by warm pressure about 45 per cent.

Description.—Viscid, transparent after filtration, nearly colorless; congeals near —18° C. (0° F.); spec. grav. about 0.965 at 15° C., 0.960 at 24° F.; odor mild, rather mawkish, taste mild, afterward slightly acrid; soluble in an equal weight of strong alcohol, partly soluble in petroleum benzin. The mixed fat acids melt near 13° C. (55.4° F.). Oxidation with dilute nitric acid yields œnanthic acid.

Constituents.—Ricinolein and palmitin; acrid principle. Ricinolic acid, $C_{18}H_{34}O_3$, is a viscid oil and by nitrous acid is converted into ricinelaidic acid, which crystallizes and melts at 50° C. (122° F.).

Properties.—Demulcent, purgative. *Dose,* 4 to 16 or 32 grams (ʒj–iv–℥j).

OLEUM GOSSYPII SEMINIS.—Cotton-seed Oil.

Origin—Gossy'pium herbáceum, *Linné,* etc. *Natural order,* Malvaceæ, Hibisceæ.

Habitat.—Asia and Africa; cultivated.

Production—The seeds are expressed and the crude red-brown oil is bleached with boiling water, followed by a little alkali. Yield 15–20 per cent.

Description.—Yellowish or yellow; spec. grav. 0.922–0.925 at 15° C., 0.917 at 24° C. of the crude oil about 0.930; neutral; congeals below 0° C. (32° F.); odor and taste mild, nutty. The mixed fat acids melt near 38° C. (100.4° F.), and solidify near 30° C. (86° F.).

Constituents.—Olein, palmitin, and non-saponifiable yellow coloring matter.

Properties.—Demulcent.

OLEUM SESAMI.—BENNE-SEED OIL.

Origin.—Sésamum indicum, *Linné*, including the variety S. orientále. *Natural order*, Pedalineæ, Sesameæ.

Habitat.—India; cultivated.

Production.—The seeds are expressed; yield 45–50 per cent.

Description.—Yellow, limpid, transparent; spec. grav. 0.922 at 15° C., 0.917 at 24° C.; congeals at about —5° C. (23° F.); nearly inodorous, bland; colored green, red, and brown-red on being agitated with a cold mixture of sulphuric and nitric acids. On agitating the oil with a solution of pyrogallol in HCl, and afterward heating the acid liquid to boiling, it will acquire a deep purple color. (Olive, almond and other oils are not thus affected.—Tocher.) The mixed fat acids melt near 38° C. (100.4° F.), and solidify near 32° C. (89.6° F.); when dry, they are colored red by HCl and sugar (Baudouin).

Constituents.—Olein, myristin, palmitin, stearin; resinoid compound.

Properties.—Demulcent.

OLEUM MAYDIS.—MAIZE OIL.

Origin.—Zéa Mays, *Linné.* *Natural order,* Gramineæ, Maydeæ.

Habitat.—Tropical America, cultivated in the warm temperate zone.

Production.—The fruit is broken, and the embryo, separated from the farinaceous endosperm, by sifting and winnowing, is expressed; yield 6–7.5 per cent. of the fruit, or about 12–15 per cent. of the embryo.

Description.—Yellow, rather viscid, transparent; spec. grav. 0,916 at 15° C.; congeals at about —10° C. (14° F.); readily saponifiable; odor peculiar, resembling that of cornmeal; taste bland; colored green by sulphuric acid, yellowish-red by nitric acid or by a mixture of nitric and sulphuric acids, and brown by nitroso-nitric acid.

Constituents.—Free fat acids 0.9 per cent., olein, palmitin, and stearin.

Properties.—Demulcent.

OLEUM LAURI.—LAUREL OIL. OIL OF BAYS.

Origin.—Laúrus nóbilis, *Linné.* *Natural order,* Laurineæ, Litseaceæ.

Habitat.—Levant and Southern Europe.

Production.—The fruit is steeped in hot water and expressed; yield about 30 per cent.

Description.—Of the consistence of butter, green, granular; melts near 40° C. (105° F.); odor strongly aromatic; taste aromatic, spicy, bitter; completely soluble in ether; coloring matter and aromatic principle soluble in alcohol; this solution is not colored red by ammonia (turmeric).

Constituents.—Laurin, olein, chlorophyll, volatile oil, resin.

Properties.—Stimulant, nervine; used in liniments and ointments.

OLEUM MYRISTICÆ EXPRESSUM.—EXPRESSED OIL OF NUTMEG.

Oleum nucistæ. Butyrum nucistæ. Nutmeg butter.

Origin.—Myrística frágrans, *Houttuyn.* *Natural order,* Myristicaceæ.

Habitat.—Molucca Islands; cultivated.

Production.—Crushed nutmegs are expressed between hot plates; yield 28 per cent.

Description.—In blocks, of the consistence of tallow, unctuous, marbled whitish and orange-brown; spec. grav. 0.990–0.995; fusing point near 45° C. (113° F.); odor aromatic; taste spicy; soluble in 4 parts of hot strong alcohol. The mixed fat acids melt at 42.5° C. (108.5° F.).

Constituents.—Mainly myristin, with little myristic acid, olein, palmitin, resin, coloring matter, and 6 to 8 per cent. of volatile oil.

Properties.—Stimulant, carminative, digestive. *Dose,* 0.3 to 1 gram (gr. v–xv), in emulsion; mostly used externally.

OLEUM THEOBROMÆ.—Oil of Theobroma.

Butyrum (Oleum) cacao. Butter of cacao.

Origin.—Theobróma Cacáo, *Linné.* *Natural order,* Sterculiaceæ, Buettnerieæ.

Habitat.—South America.

Production.—The seeds are deprived of the testa and expressed between heated plates; yield 35–45 per cent.

Description.—Yellowish-white, becoming white on keeping, harder than tallow, yet melting in the mouth; spec. grav. about 0.95; fusing-point between 30° and 33° C. (86° and 91.4° F.); aromatic, of a bland chocolate-like taste. On dissolving 2 grams (gr. xxx) of the oil in 4 grams (ʒj) of petroleum benzin or of ether, by immersing the test-tube in water of 17° C. (62.6° F.), and afterward plunging the test-tube into water of 0° C. (32° F.), the mixture does not become turbid, and does not produce a granular deposit, in less than three minutes.

Constituents.—Stearin, laurin, arachin, and olein, with glycerides of formic, acetic, and butyric acids, and probably a little resin.

Properties.—Demulcent. *Dose,* 2 to 4 grams (ʒss–j), in emulsion, mostly used for suppositories and in ointments.

OLEUM PALMÆ.—PALM OIL.

Origin.—Elæ'is guineénsis, *Jacquin.* *Natural order*, Palmeæ, Cocaineæ.

Habitat.—Western Africa; cultivated in tropical America.

Production.—The fruit is heated with water and expressed.

Description.—Harder than butter, orange-red, bleached by exposure to light, and by rapidly heating to 240° C. (464° F.); spec. grav. 0.95; fusing-point 27° C. (80.6° F.); odor agreeable, violet-like; taste bland. It rapidly becomes rancid, and acquires an acid reaction, a higher melting-point, and an acrid taste.

Constituents.—Palmitin, olein, coloring matter.

Properties.—Demulcent; used in ointments, mostly for soap and candles.

OLEUM GYNOCARDIÆ.—CHAULMUGRA OIL.

Origin.—Gynocárdia (Chaulmoógra, *Roxburgh*) odoráta, *R. Brown.* *Natural order*, Bixineæ.

Habitat.—Malayan Peninsula.

Production.—The seeds are boiled in water and expressed; yield about 35 per cent., with ether 50 per cent. of oil.

Description.—Of the consistence of tallow, brownish-white, of an acid reaction; fusing-point about 40° C. (104° F.); odor peculiar; taste acrid; partly soluble in cold alcohol; by sulphuric acid colored red-brown, afterward olive-green; after agitation with warm water, the oil separates as a milky emulsion.

Constituents.—Albuminoids; glycerides of cocinic, hypogæic, palmitic, and gynocardic ($C_{14}H_{24}O_2$) acids, the last two also in the free state. The acrid taste and reaction with sulphuric acid are due to gynocardic acid.

Properties.—Alterative, emetic. *Dose,* about 0.3 gram (gr. v), in emulsion or dissolved in other oils.

OLEUM COCOIS.—COCOANUT OIL.

Origin.—Cócos nucífera, *Linné.* *Natural order,* Palmeæ, Cocaineæ.

Habitat.—Tropical countries.

Production.—The seeds are boiled with water and expressed; yield 50 to 60 per cent.

Description.—Of butyraceous consistence, white; melting-point about 25° C. (77° F.); odor disagreeable; becomes rapidly rancid. The soap is soluble in salt water. The mixed fat acids melt at 24.6° C. (76° F.).

Constituents.—Glycerides of lauric (predominating) with palmitic, myristic, caprinic, caprylic, and capronic acids, and very little olein.

Properties.—Demulcent; mostly used for soap.

BUTYRUM.—BUTTER.

Origin.—Bos Taúrus (femina), *Linné.* *Class*, Mammalia; *Order*, Ruminantia; *Family*, Bovidæ.

Habitat.—Domesticated.

Production.—The cream rising upon cows' milk is churned.

Description.—Soft, yellow, neutral, spec. grav. about 0.93, fusing-point near 32° C. (89.6° F.), congealing-point near 23° C. (73° F.).; odor delicate and sweet; taste bland. For medicinal use, butter should be freed from salt and casein by melting it in warm water and decanting the clear liquid. 100 parts of pure butter on being saponified by an alkali, and the soap decomposed by hydrochloric acid, yield fat acids, which, after washing (to remove about 8 per cent. of volatile fat acids) and drying, weigh between 85 and 88 parts. Most other fats yield over 95 per cent. of fat acids insoluble in water.

Constituents.—Odorous principle a trace, olein about 30 per cent., palmitin and stearin about 68 per cent., and about 2 per cent. of the glycerides of butyric, capronic, caprylic, and caprinic acids. Butter having an acid reaction contains free butyric acid.

Properties.—Demulcent; lenitive; used as a dietetic and in ointments.

LANOLINUM.—LANOLIN. WOOLFAT.

Adeps Lanæ; Œsypum.

Origin.—O'vis A'ries, *Linné.* *Class*, Mammalia; *Order*, Ruminantia; *Family*, Bovidæ.

Habitat.—Domesticated.

Production.—Sheeps' wool is treated with a weak soda solution and the solution acidulated. The remaining wool is treated with benzin, the liquid distilled and the residue deprived of color by oxidizing agents or sunlight. Or crude woolfat is emulsionized with alkali solution; and the non-saponified portion separated and decolorized.

Description.—Rather firm, the crude woolfat of various shades of greenish-brown and strong animal odor; after decolorizing yellowish or whitish, of weak animal odor, and of neutral reaction; readily absorbed by the skin; spec. grav. 0.973; melting-point about 40° C. (104° F.); miscible with its weight of water, also with glycerin; saponified with difficulty. On being heated in the water-bath, it should lose not over 30 per cent. of water. When heated with soda, ammoniacal vapors should not be given off. Anhydrous lanolin is soluble in ether and chloroform, and but slightly soluble in hot alcohol.

Constituents.—Cholesterin esters of stearic, palmitic, oleic, valerianic, and other acids; ash about 0.2 per cent.

Properties.—Lenitive; used in ointments.

ADEPS.—LARD.

Axungia porci.

Origin.—Sus scrófa, *Linné.* *Class,* Mammalia; *Order,* Pachydermata; *Family,* Suidæ.

Habitat.—Domesticated.

Production.—The fat attached to the mesentery, omentum and kidneys is melted with water and strained.

Description.—Soft, white, neutral, spec. grav. 0.940; melting-point near 38° C. (100.4° F.); odor faint; taste bland; completely soluble in ether. Distilled water boiled with lard does not acquire an alkaline reaction, is not precipitated by silver nitrate, and is not colored blue by iodine. Lard boiled for five minutes with a 2 per cent. solution of silver nitrate, remains clear and free from color (absence of NaCl, cottonseed oil, etc.; Ritsert, 1889). Hot alcohol agitated with lard does not acquire an acid reaction (resins, stearic, and other acids). The mixed fat acids melt at 44° C. (111° F.).

Constituents.—Olein 50 to 60 per cent., palmitin and stearin.

Properties.—Demulcent, lenitive; used in ointments and cerates.

SEVUM.—SUET.

Sevum ovillum.

Origin.—O′vis A′ries, *Linné.* *Class,* Mammalia; *Order,* Ruminantia; *Family,* Bovidæ.

Habitat.—Domesticated.

Production.—The internal fat is melted in a water-bath and strained.

Description.—Solid, smooth, white, neutral; melting-point above 45° C. (113° F.); congealing-point about 39° C. (102° F), rising to about 44° C. (111° F.); odor slight; taste bland.

Constituents.—Stearin and palmitin (predominating), olein, and hircin.

Allied Fat.—Sevum bovinum, beef tallow, the internal fat of Bos Taurus, *Linné.* Like the preceding, but melting-point near 40° C. (104° F.); contains more palmitin, no hircin.

Properties.—Lenitive; used in cerates.

CETACEUM.—SPERMACETI.

Origin.—Physéter macrocéphalus, *Linné.* *Class,* Mammalia; *Order,* Cetacea; *Family,* Physeteridæ.

Habitat.—Pacific and Indian Oceans.

Production.—The fat contained in cavities in the head and in other parts of the body is allowed to congeal, expressed and remelted in water.

Description.—White, translucent, slightly unctuous masses; fracture scaly crystalline, of a pearly lustre; pulverizable in the presence of a little alcohol; spec. grav. 0.94 to 0.95; melting-point near 50° C. (122° F.); congealing-point near 45° C. (113° F.); soluble in ether, chloroform, benzin, and in boiling alcohol.

Adulteration.—Stearic acid is extracted from melted spermaceti by treatment with aqueous solution of sodium carbonate or of ammonia, and precipitated from the cold liquid by excess of acetic acid.

Constituents.—Mainly cetyl palmitic ester or cetin, $C_{16}H_{33}.C_{16}H_{31}O_2$, with small amounts of other esters.

Properties.—Lenitive; used in ointments and cerates.

CERA.—WAX, BEESWAX.

Origin.—A'pis mellífica, *Linné.* *Class,* Insecta; *Order,* Hymenoptera.

Production.—The honeycomb, after draining the honey, is melted in water and the melted wax decanted. It is bleached by exposing the wax in thin sheets to moisture and sunlight.

Description.—Cera flava, Yellow wax. Yellow or somewhat brownish-yellow, breaking with a granular fracture at and below 10° C. (50° F.), becoming plastic by the heat of the hand; spec. grav. 0.96 to 0.97; melting-point between 62° and 63° C. (about 145° F.); congealing with a smooth and level surface; odor aromatic, honey-like; taste mild; soluble in boiling ether and in chloroform; partly soluble in cold ether, benzol, and benzin, and in hot alcohol.

Cera alba, White wax. Yellowish-white circular cakes, somewhat translucent in thin layers, brittle in the cold, but becoming plastic by the heat of the hand; spec. grav. 0.97; melting-point 64° to 65° C. (147° to 149° F.); odor slightly rancid.

Constituents.—Aromatic and coloring matters in yellow wax; hydrocarbons (probably $C_{27}H_{56}$ and $C_{34}H_{64}$) about 12 to 14 per cent.; cerin or cerotic acid, $C_{27}H_{54}O_2$ (crystallizes from boiling alcohol); myricin or myricyl palmitate, $C_{30}H_{61}.C_{16}H_{31}O_2$ (the principal constituent; acicular crystals, slightly soluble in hot alcohol, soluble in hot ether), with small quantities of an alcohol, $C_{25}H_{52}O$, and of ceryl-alcohol, $C_{27}H_{56}O$. The acid number varies between about 18.5 and 21, and the true saponification number between about 67.5 and 72.5.

Adulterations.—Tallow renders wax softer and lessens its specific gravity. Paraffin is not destroyed by hot sulphuric acid; 5 grams of the wax are heated in a flask for fifteen minutes with 25 grams of strong sulphuric acid to 160° C. (320° F.), and the mixture is diluted with distilled water; a layer of paraffin should not be separated. Resin is dissolved by hot 70 per cent. alcohol, and, after cooling, is precipitated by water. Mineral and starchy substances are insoluble in chloroform.

Properties.—Protective; used in ointments, cerates, and plasters.

DRUGS ARRANGED ACCORDING TO ORIGIN.

I. OF ANIMAL ORIGIN.

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Mammalia.			
Rodentia.	Castor Fiber, *Linné.*	Castoreum	37
Carnivora.	Viverra Zibetha, *Schreber*, etc.	Civet	40
Ruminantia.	Bos Taurus, *Linné.*	Blood	40
		Pepsin	38
		Oxgall	41
		Milk	40
		Butter	508
		Milk sugar	443
		Fixed oil	498
		Beef tallow	510
		Bone	44
		Gelatin	35
	Ovis Aries, *Linné.*	Pepsin	38
		Suet	510
		Lanolin	508
	Moschus moschiferus, *Linné.*	Musk	35
Hyracoidea.	Hyrax capensis, *Cuvier.*	Hyraceum	39
Pachydermata.	Sus scrofa, *Linné.*	Pepsin	38
		Lard	509
		Fixed oil	499
Cetacea.	Physeter macrocephalus, *Linné.*	Spermaceti	510
		Ambergris	39
Aves.			
Gallinæ.	Gallus Bankiva, *Temminck.*	Egg (shell, albumen, yelk)	32
Pisces.			
Teleostia.	Gadus Morrhua, *Linné.*	Cod-liver oil	501
	Gadus merluccius, *Linné.* Otolithus regalis, *Cuvier.*	American isinglass	34
Sturiones.	Acipenser Huso, *Linné.*	Russian isinglass	34

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Hymenoptera.	Apis mellifica, *Linné.*	Beeswax	511
		Honey	444
	Cynips gallæ tinctoriæ, *Olivier.*	Nutgalls	400
Coleoptera.	Cantharis vesicatoria, *De Geer.*	Cantharides	27
	Cantharis vittata, *Latreille.*	Potato fly	28
	Mylabris cichorii, *Fabricius*, etc.	Chinese blistering flies	29
	Larinus mellificus, *Jeckel*, etc.	Manna	442
Orthoptera.	Blatta orientalis, *Linné.*	Cockroach	31
Hemiptera.	Coccus cacti, *Linné.*	Cochineal	29
	Coccus Lacta, *Kerr.*	Lac	463
Crustacea.			
Decapoda.	Astacus fluviatilis, *Fabricius.*	Crabs' stones	43
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Decapoda.	Sepia officinalis, *Linné.*	Cuttlefish bone	42
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Monomya.	Ostrea edulis, *Linné.*	Oyster shell	43
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Annulata, Apoda.	Sanguisuga medicinalis, *Savigny*, etc.	Leech	31
Polypiphera.			
Octocoralla.	Corallium rubrum, *Lamarck.*	Red coral	42
Hexacoralla.	Oculina virginea, *Lamarck.*	White coral	42
Poriphera.			
Ceratospongia.	Spongia officinalis, *Linné.*	Sponge	33

II. OF VEGETABLE ORIGIN.

1. SPERMATOPHYTA.

a. Dicotyledones, Polypetalæ.

Ranunculaceæ, Anemoneæ.	Anemone pratensis, *Linné*, etc.	Herb	265
	Anemone Hepatica, *Linné.*	Leaves	252
Ranunculeæ.	Ranunculus bulbosus, *Linné*, etc.	Herb	267

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Ranunculaceæ, Helleboreæ.	Hydrastis canadensis, *Linné*.	Rhizome and roots	138
	Helleborus niger, *Linné*, etc.	Rhizome and roots	141
	Coptis trifolia, *Salisbury*.	Herb	267
	Nigella damascena, *Linné*, etc.	Seed	383
	Delphinium Staphisagria, *Linné*.	Seed	383
	Delphinium Consolida, *Linné*.	Seed	382
	Aconitum Napellus, *Linné*, etc.	Tuberous root	152
		Leaves	252
	Aconitum ferox, *Wallich*, etc.	Tuberous root	154
	Actæa alba, *Linné*.	Rhizome and roots	142
	Cimicifuga racemosa, *Elliott*.	Rhizome and roots	142
	Xanthorrhiza apiifolia, *L'Heritier*.	Rhizome and roots	148
Magnoliaceæ, Wintereæ.	Drimys Winteri, *Forster*.	Bark	208
	Illicium verum, *Hooker filius*.	Fruit	347
		Volatile oil	348, 486
	Illicium religiosum, *Siebold*.	Fruit	347
Magnolieæ.	Magnolia glauca, *Linné*, etc.	Bark	183
	Liriodendron Tulipifera, *Linné*.	Bark	183
Menispermaceæ, Tinosporeæ.	Jateorrhiza Calumba, *Miers*.	Root	81
	Anamirta Cocculus, *Wight et Arnott*.	Fruit	335
Cocculeæ.	Abuta amara, *Aublet*.	Root and stem	96
	Abuta rufescens, *Aublet*.	Root	96
	Menispermum canadense, *Linné*.	Rhizome	147

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Menispermaceæ, Pachygoneæ.	Chondodendron tomentosum, *Ruiz et Pavon.*	Root	95
Berberidaceæ, Berbereæ.	Berberis vulgaris, *Linné.*	Root	98
		Root bark	185
	Berberis aquifolium, *Pursh*, etc.	Rhizome and roots	148
	Caulophyllum thalictroides, *Michaux.*	Rhizome and roots	139
	Podophyllum peltatum, *Linné.*	Rhizome	129
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	Nymphæa odorata, *Aiton.*	Rhizome	128
Papaveraceæ, Papavereæ.	Papaver Rhœas, *Linné.*	Petals	313
	Papaver somniferum, *Linné.*	Fruit	345
		Milk-juice (opium)	425
		Seed	394
		Fixed oil	500
	Sanguinaria canadensis, *Linné.*	Rhizome	125
	Chelidonium majus, *Linné.*	Herb	268
Fumarieæ.	Dicentra canadensis, *De Candolle.*	Tuber	154
Cruciferæ, Alyssineæ.	Cochlearia Armoracia, *Linné.*	Root	76
Brassiceæ.	Brassica nigra, *Koch.*	Seed	378
		Fixed oil	498
		Volatile oil	379, 486
	Brassica alba, *Hooker filius.*	Seed	377
		Fixed oil	498
	Brassica Rapa, *Linné*, etc.	Seed	379
Lepidineæ.	Capsella Bursa-pastoris, *Moench.*	Herb	268
Cistineæ.	Helianthemum canadense, *Michaux.*	Herb	269
Violarieæ, Violeæ.	Viola tricolor, *Linné.*	Herb	274
	Ionidium Ipecacuanha, *Ventenat.*	Root	93
Canellaceæ.	Canella alba, *Linné.*	Bark	207
	Cinnamodendron corticosum, *Miers.*	Bark	208
Bixineæ, Pangieæ.	Gynocardia odorata, *R. Brown.*	Seed	388
		Fixed oil	507
Polygaleæ.	Polygala Senega, *Linné*, etc.	Root	54
	Polygala rubella, *Willdenow.*	Herb	270
	Krameria triandra, *Ruiz et Pavon*, etc.	Root	99

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Caryophylleæ, Sileneæ.	Gypsophila paniculata, *Linné*.	Root	57
	Saponaria officinalis, *Linné*.	Root	57
Hypericineæ, Hypericeæ.	Hypericum perforatum, *Linné*.	Herb	269
Guttiferæ, Garcineæ.	Garcinia Hanburii, *Hooker filius*.	Gum resin	454
	Garcinia Mangostana, *Linné*.	Fruit	340
Ternstrœmiaceæ, Gordonieæ.	Camellia Thea, *Link*.	Leaves	242
Dipterocarpeæ.	Dryobalanops Camphora, *Colebrook*.	Stearopten	482
	Dipterocarpus turbinatus, *Gaertner*.	Oleoresin	473
	Vateria and Hopea spec.	Resin	461
Malvaceæ, Malveæ.	Althæa officinalis, *Linné*.	Root	79
	Althæa rosea, *Cavanilles*.	Flowers	313
	Malva sylvestris, *Linné*.	Flowers	314
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		Seed hairs	410
		Fixed oil	503
Sterculiaceæ, Sterculieæ.	Cola acuminata, *R. Brown*.	Seed	374
Buettnerieæ.	Theobroma Cacao, *Linné*.	Seed	373
		Fixed oil	506
Tiliaceæ, Tilieæ.	Tilia americana, *Linné*, etc.	Flowers	310
Lineæ, Eulineæ.	Linum usitatissimum, *Linné*.	Seed	384
		Fixed oil	499
Erythroxyleæ.	Erythroxylon Coca, *Lamarck*.	Leaves	229
Zygophylleæ.	Guaiacum officinale, *Linné*.	Wood	164
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Rutaceæ, Cusparieæ.	Galipea Cusparia, *St. Hilaire*.	Bark	209
	Monnieria trifolia. *Linné*.	Leaves	218
Ruteæ.	Ruta graveolens, *Linné*.	Herb	255
		Volatile oil	255, 486
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	Empleurum serrulatum, *Aiton*.	Leaves	250
Zanthoxyleæ.	Xanthoxylum carolinianum, *Lambert*, etc.	Bark	199
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	Xanthoxylum elegans, *Engler*.	Leaves	218
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Aurantieæ.	Citrus Limonum, *Risso*.	Fruit	341
		Rind	363
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	Picræna excelsa, *Lindley*.	Wood	163
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	Melia Azadirachta, *Linné*.	Gum	446
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	Rhus glabra, *Linné*.	Fruit	330
	Rhus semialata, *Murray*.	Galls	401
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